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FINAL REPORT

DIGITAL DATA PROCESSING SYSTEM

DYNAMIC LOADING ANALYSIS

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ABSTRACT

This Final Report provides the results of a 10-month study by System Development Corporation (SDC) that involved the simulation and analysis of the Space Shuttle Orbiter Digital Data Processing System (DDPS). This Dynamic Loading Analysis was performed for the NASA Johnson Space Center under contract NAS9-14630. The Mated Flight and Postseparation Flight phases of the Space Shuttle's Approach and Landing Test (ALT) configuration were modeled utilizing the Information Management System Interpretative Model (IMSIM) in a computerized simulation modeling of the ALT hardware, software, and workload.

System Requirements simulated for the ALT configuration were defined. Sensitivity analyses determined areas of potential data flow problems in DDPS operation. Based on the defined system requirements and the sensitivity analyses, a test design is described for adapting, parameterizing, and executing the IMSIM. Varying load and stress conditions for the model execution are given. The analyses of the computer simulation runs were documented as results, conclusions, and recommendations for DDPS improvements.

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1. SUMMARY

This report summarizes the results of a simulation analysis of the Space Shuttle Orbiter Digital Data Processing System. This study was performed for the Avionics Integration Branch of the Avionics Systems Engineering Directorate for NASA's Johnson Space Center. The study was conducted by members of the Systems Analysis Center of the Satellite Control Program of System Development Corporation under contract NAS9-14630, and was performed during the period of 24 June 1975 through 30 April 1976.

NASA Technical Monitor has been Mr. Carroll T. Dawson of the JSC Avionics Integration Branch. Under Mr. Dawson's direction, SDC has performed an extensive simulation modeling analysis utilizing IMSIM of the Approach and Landing Test (ALT) configuration, with total emphasis on the related impact on the orbiter's Digital Data Processing System (DDPS). SDC personnel involved in this study and primary responsibilities were:

Richard W. Bilek - Head, Systems Analysis Center: overall project supervision and quality assurance
Jacobus J. Lagas - Project Manager: requirements definition, test design, execution, and analysis.
James J. Peterka - model adaptation, execution, and analysis
Alfred E. Tucker - requirements definition, sensitivity analysis, and model parameterization.

1.1 OBJECTIVES

As the end product of this contract, this report constitutes a detailed analysis of the DDPS, and identifies constituents of the system which are potentially subject to overload under stress and which may significantly degrade performance of the system in critical situations. The analysis is based on a quantitative representation of the DDPS as a discrete simulation model and on the results derived from the operation of this model. This report also includes a qualitative study of the system organization and structure to determine the adaptability of the system to varying loads and requirements. This information was used to parameterize the model and was instrumental in completing the analyses.

1.2 DATA SOURCES

Sources for the study included current documentation of the DDPS/ALT functional requirements and detailed design specifications as listed in Appendix F. Upon NASA direction, the study was primarily confined to the hardware and software which may be employed during the airborne and flight phases of the ALT. These efforts were applied to investigation of characteristics and activities which are discernible to a time resolution of one millisecond; i.e., items

such as control signals, IOP memory access for commands, parity checking, and CPU instruction execution were considered only insofar as collective effects are concerned. The effort was focused on quantitative data processing aspects of the DDPS, i.e., data flow, throughput, response, etc., rather than upon planned information content or quality, reliability, human engineering, or other more qualitative aspects.

Level A Hardware specifications and the Functional Subsystem Software Requirements (FSSR) System Interface document were used to determine the DDPS ALT configuration and the nature of the components to be connected to the GPCs via data buses for communication and control. These sources also provided information on the processing rates of the CPUs, capacities for data retention by terminal elements such as displays, transmission rates for components and data buses, and sizing of message transmissions. Documents pertaining to the Central Processing Units (CPUs) and Input-Output Processors (IOPs) functional descriptions and principles of operation were consulted to gain an understanding of the functioning of these modules.

Level A Software specifications, requirements for ALT Guidance, Navigation, and Control (GN&C) and System Management (SM) plus functional design specifications for ALT GN&C, SM, and Systems Software were used to determine the structure of the DDPS software. Significant program modules to be executed in these simulations were also determined from these documents. For each of these program modules, characteristics were determined with regard to the conditions for executing the module, the impact of the current system status on the execution time of the module, the effect that execution of the module has on the system status, and the data transmissions performed by the module. This information was used to compile a set of system states for the DDPS which were principal factors in determining system loading.

1.3 MODEL DEVELOPMENT

The information which was derived from study of the source documents as described in section 1.2 was used to adapt and parameterize a discrete event simulation model of the DDPS. The basic model is a computer program simulator for information management simulation, denoted as "IMSIM" (Information Management System Interpretive Model). This program was originally developed by SDC under contract to NASA to provide methods and capabilities for performing dynamic loading studies of computer-based data processing systems, and has been well suited to the simulation of the Shuttle Orbiter DDPS. IMSIM is described in detail in the IMSIM User's Manual (Reference 2), and summarized in Section 5.1.3.

Hardware characteristics of each component of the DDPS were transcribed to IMSIM input specification forms, and configuration spec fication forms were used to specify the connection of terminal elements and memory units to data buses. The DDPS components so represented are the Display Electronic Units, Display Units, Multiplexer/Demultiplexers, Display Driver Units, Keyboard Units, PCMMUs, and the memory units and CPUs of the GPCs. The data buses themselves are represented as IMSIM "datalinks" in the model (see Appendix B).

Depiction of the software for simulation is somewhat more complex than the hardware representation. It is necessary to exercise value judgement in deciding whether a program module is to be individually represented, combined with other modules for collective representation, or excluded from the model. Modules such as the Rate Gyro FDIR, require significant time for execution, but involve no change in system state which would affect loading. On the other hand, modules such as control segments, cause a significant change of state when executed but involve only inconsequential execution time. Some modules are called by several other modules, while others are called by only one.

Software is described for IMSIM in terms of schedulable "tasks", loadable "routines", mathematical expressions or tables which yield execution time as a function of the model state, and logic sequences which manipulate the system state. It was necessary to map the salient software characteristics of the DDPS into IMSIM counterparts so as to retain a meaningful correspondence between system and model constituents, while conforming to the rules and constraints imposed by IMSIM. (It should be noted that this problem is common to all modeling processes, regardless of the tools used, since a model is normally intended to be only a suitable approximation of an actual system.)

Schedulable processes such as SPECS, OPS, and cyclic executives were designated as IMSIM tasks, and logic sequences were developed to schedule them as a function of the simulated clock, externally introduced events, or the simulated system state (e.g., mode or pending keyboard request). Program modules which are executed for a specific task, or for a specific set of tasks, were collectively described as "routines". For each routine, a mathematical algorithm was prepared which indicates the amount of computation to be simulated when a task which employs the routine is activated, as a function of the system state at the time of activation. More than one routine may be employed in performance of a task. For each DDPS program module which significantly alters the system state when executing, a similar change was programmed into IMSIM as a logic sequence, and was synchronized for concurrent execution with the appropriate task.

Sizing of program modules was not a significant factor for the model, since dynamic memory allocation and loading are not characteristics of the ALT, and they therefore have no impact on system loading.

Data transmission within the DDPS is described to IMSIM in terms of "messages". A message can define a set of transmissions, whether parallel or sequential, and with varying origins and destinations. All transmissions simulated for the DDPS are between the memory of a GPC and some other unit (e.g. a MDM or PCMMU, or even another GPC memory in the case of intercomputer communication). Similar transmissions such as reading of data from the three IMUs, are described by a single message which represents concurrent transmissions from FF01, FF02, and FF03 (see Appendix E for abbreviations) to the GPC memory. Messages are associated with tasks and are synchronized to task performance; e.g., if performance of a task is deferred or interrupted for higher priority processing, its associated transmissions may be delayed (but not interrupted).

The general rules used to specify transmission lengths and execution periods are (a) maximum transmission lengths, (b) biased random execution of alternate or optional program sequences, and (c) 130% of estimated average periods for sequences for which precise timing figures were not available.

1.4 APPLIED WORKLOADS

The workload specification for the DDPS model is actually an integral part of the software representation, but it must be activated and controlled by an event schedule which effectively specifies parametric values for the simulated software. Various event schedules were prepared to represent segments of the ALT airborne and flight phases. Each schedule was designed to provide a realistic sequence of events with the additional objective of causing maximum stress during a critical time period. The event schedules were developed and modified in the course of the iterative process of dynamic simulation and analysis of results.

1.5 DYNAMIC SIMULATION

SDC initially performed a series of computer runs with the DDPS model for validation and verification against predicted performance under unsophisticated loading. Subsequently, a series of "production" runs was conducted with sophisticated stress loading. The automatic monitoring and data reduction facilities of IMSIM were augmented with special software probes and reports to obtain the maximum of useful information from the runs, and to simplify extrapolation of results to predicted performance of the DDPS. IMSIM is a discrete event simulator and generally functions in a deterministic mode, although random behavior can be simulated by drawing pseudorandom numbers from built-in number generators. Randomness was incorporated in the delivery of calculated execution times for some routines and is discussed in paragraph 5.2.4.2.

One major simplification of DDPS simulation was introduced for most of the computer runs. Since the GPCs of the DDPS are all organized as a redundant set for the ALT, they must necessarily perform identical functions in close synchronization. In fact, the GPCs are precisely synchronized in the model unless a perturbation is explicitly introduced. Thus, no additional information is obtained from simulating the functions of four GPCs in a redundant configuration as opposed to a single GPC insofar as processor loading is concerned. Since simulation of parallel computations must be performed serially on a simplex computer, it is both cost-effective and efficient to eliminate the redundancy in the model. Note that intercomputer communication is still simulated among the four GPCs in order to achieve a realistic load on the ICC data buses and to properly represent ICC activity for the single GPC. Some runs were made with the four GPCs simulated as four active, separate virtual machines, to verify the above.

Data produced from each simulation run include a history of the important events and activities, a summary of the final state of the model, and statistics on resource utilization and software functions. Snapshots were often taken of the dynamic state of the model in order to investigate stress situations in more detail.

1.6 SIMULATION ANALYSIS

Results of simulation runs were analyzed to determine how the simulated DDPS performed under specified workloads and what workload variations should be considered for subsequent runs. The data from history outputs (see Appendix C) provide specific information on task contention for resources and the maximum interference in performing each type of task. The history output also provides valuable insight regarding patterns of behavior in DDPS operation and situations of peak strain. The summary results (see Appendix D) provide information on backlogging of tasks for CPU service, delays incurred in performing I/O, system component utilization, and statistics on contention for resources. System status information yielded clues as to potential system behavior under different conditions, which could then be imposed for subsequent simulation runs. In consequence, data were accumulated from the series of runs which describe the DDPS model behavior and performance under a variety of stress situations. Subject to the conditions and assumptions detailed in Section 5, SDC is confident that the model accurately reflects the operation of the DDPS and that the results described in Section 2 are indicative of the expected operational performance of the DDPS.

2. RESULTS

2.1 HARDWARE CONFIGURATION ANALYSIS

SDC conducted a study and analysis of the DDPS hardware system as a prerequisite to development of the model. The study was confined to investigation of components involved in data transmission and processing, and the interconnection of the components. The subsequent analysis determined the loading characteristics of components and the constraints under which they interact. Emphasis was placed on consideration of hardware functions that operate on a time scale of a millisecond or more.

The DDPS system with which the investigation was concerned is the ALT configuration as specified in Reference 7, the Level A Hardware Specification. Components, that are not employed during airborne of flight phases of ALT were nevertheless analyzed and are represented in the DDPS model for completeness, and possible use in later studies. The ALT configuration as it was viewed for the purpose of the analysis and model construction is depicted in Figure 2-1. The principal factors in the makeup of this configuration are: (1) four independent computers which can be forced to operate in synchronized or lockstep mode, (2) numerous and varied peripheral equipments which may perform local functions asynchronously with the computers but with which the computers must regularly communicate, and (3) a network of data buse which provide redundant paths between components for communication, and which permit broadcasting of data to several components.

Analysis of programmable components such as the PCMMUs and IOPs indicated that the potential for variations in their operation would not have significant impact on the overall system loading at the millisecond level of discrimination; i.e., they can be treated as essentially hardwired components with relatively fixed behavioral characteristics. Local data transfer functions such as those between DEUs and connected keyboards and display units were considered to have minimal impact on the overall system and could safely be integrated with the behavioral characteristics of the unit in direct communication with the computers (e.g., DEUs and MDMs).

In summary, the analysis indicated that the ALT configuration should be treated as a computer-oriented data processing system, with a bus network and bus terminals, to and from which data are transmitted to the computers.

2.2 SOFTWARE STRUCTURE ANALYSIS

Through the structural analysis of DDPS software, SDC determined the conditions and methods for invoking all of the program modules. The hierarchical organization of the DDPS software and the documentation techniques employed in the design specifications enabled a systematic approach to the development and parameterization of a software model. The control interface specifications and the structured control flow proved particularly useful in this effort.

Module invocation is either a direct or indirect call from another module, or activated as a scheduled process by the Flight Control Operating System (FCOS). The scheduled processes which are significant to system loading

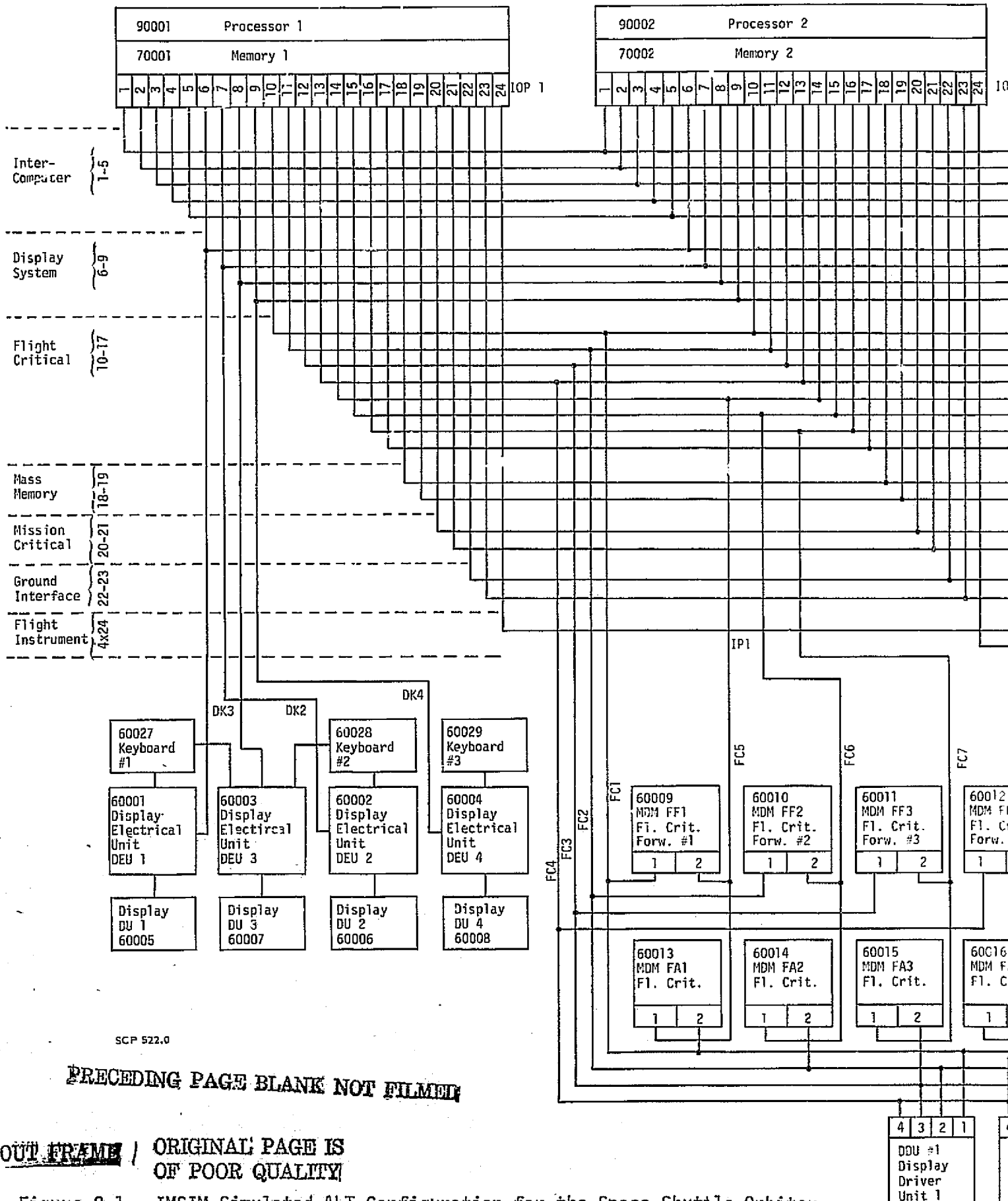

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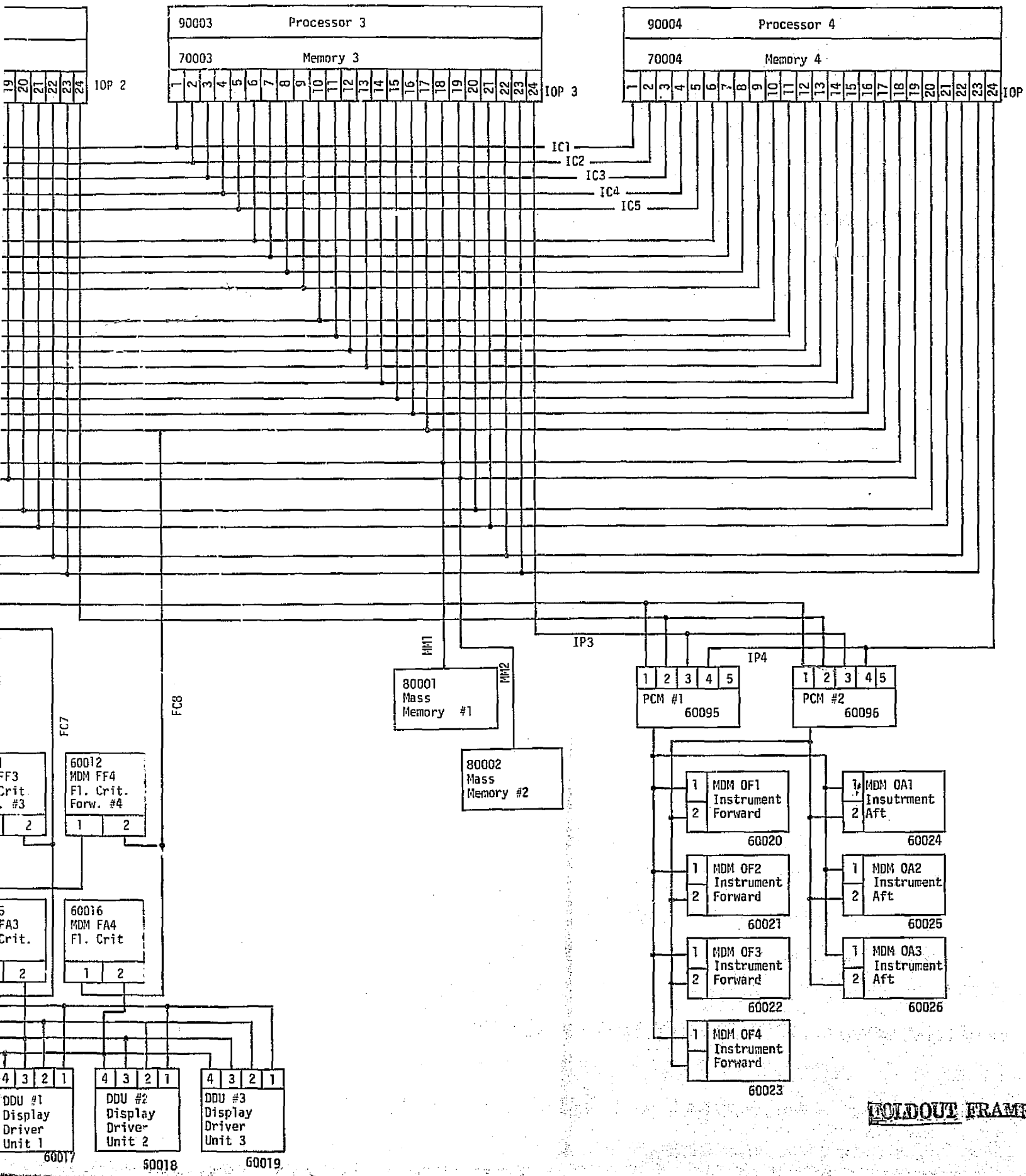
Figure 2-1. IMSIM Simulated ALT Configuration for the Space Shuttle Orbiter



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during the airborne and flight phases of ALT are listed in Table 2-I, together with conditions for executing each. Virtually all computation performed by the CPUs is for these processes; i.e., these are tasks to be performed by the CPUs using the program modules as tools. Certain of the processes are used only to effect mode or state transitions; these include the various control segments and the Navigation Transition Task. They occur infrequently and involve negligible processing. A class of "cyclic" processes deals with activities which must respond to events in a timely manner. Processes of this class are scheduled during appropriate phases of the mission, to be activated at frequent intervals. The bulk of computation and data processing is either performed as low priority, long-term tasks, or as a series of short segments which can be incorporated in higher priority cyclic tasks.

Since the DDPS is required to deal with fluctuating loads and possible component failures under severe real-time constraints, the software is designed for self-adaptation to environment and demands within specified limits, and "tuning" parameters have been incorporated to ensure that it meets stated requirements through effective utilization of the DDPS resources. Three features which have been incorporated in the software design facilitate fine tuning for optimum performance: (a) a priority/interrupt system for scheduled processes, (b) distribution of recurrent functions among cyclicly scheduled processes with individually assigned frequencies for execution, and (c) use of a central dispatcher to call modules as subfunctions of a cyclic process, at multiples of the fundamental interval for the process.

During ALT airborne and flight phases, all I/O control is concentrated in four cyclic tasks and one event-triggered task; viz., the System Software Interface Processor, the Fast Cycle Executive, System Management Data Acquisition, the Cyclic Display Processor, and the User Interface Control Supervisor. In general, I/O is initiated by these processes through calls on FCOS, and the processes may yield control of the CPU and enter a "wait" state until the requested I/O is complete. Since I/O requests can be enqueued for execution by the IOPs, the CPU can be assigned to lower priority processes during such waiting periods.

Analysis of the software generally did not include consideration of the mission-oriented aspects of the DDPS; i.e., logical intent, mathematics, reliability and information content of data, etc., were not investigated except as required to determine their potential loading impact on the DDPS. This view from a data processing standpoint has determined that certain combinations of functions can be invoked concurrently, which are probably not logically consistent with each other or with the state of the system in the context of mission requirements. For example, it appears to be possible for an IMU calibration SPEC to be invoked during flight, although this is a time-consuming activity which is indicated as a preflight SPEC in Software Awareness Memo #10H for FSW Process Priorities (Reference 34).

Table 2-1. Significant Scheduled Processes of ALT

Software Designator	Descriptive Name	NASA Priority*	Invocation
AIE	System Software Interface Proc.	250	40 ms intervals
GEF	Fast Cycle Executive	250	40 ms intervals unless mode 200
GMA	Minor Cycle Executive	242	40 ms intervals unless mode 200 and platform not released
GAD	Mated/Drop Test Idle Mode	238	40 ms intervals during mode 200
SDA	SM Data Acquisition	234	50 ms intervals
DMI	MCDS Input Processor	230	200 ms intervals
GEM	Mated/Drop Executive	228	80 ms intervals
DMC	User Interface Control Supervisor	226	For MCDS or ICC msg, or applic. service request
GAA	Mated/Drop OPS Control Segment	218	For OPS2 message
SFO	SM Flight OPS Control Segment	210	For OPS2 message
GUC	IMU Operation SPEC Control Seg.	202	For SPEC message
GUH	RM-NAV SPEC Control Segment	198	For SPEC message
GUI	RM-CONT SPEC Control Segment	194	For SPEC message
GUK	NAV/TARGET Update SPEC Control Seg.	190	For SPEC message
GUA	Horizontal Situation SPEC Control Seg.	186	For SPEC message
GUB	Vertical Situation SPEC Control Seg.	182	For SPEC message
DCI	Cyclic Display Processor	142	100 ms intervals
ARA	GPC Switch Monitor	138	1000 ms intervals
DGI	LDB I/O Processor	134	40 ms intervals
GET	Navigation Transition Task	126	once for mode 204 for Navigation Transition Event
SDM	SM Performance Monitor Ctrl.	122	500 ms intervals
GEN	TAEM Navigation Cycle Executive	118	2000 ms intervals after platform release
GMG	IMU Major Cycle Executive	114	320 ms intervals for IMU function
GMY	IMU Velocity and Tilt	110	as SPEC option
GTX	FCS/DD Dedicated Display Checkout	106	as SPEC option
GMT/GMU/GMV	IMU Calibration	80/85/90	as SPEC option
GMX	IMU Gyrocompass Alignment	75	as SPEC option
GMS	IMU Attitude Determination	70	as SPEC option

*higher values indicate higher priorities

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2.3 DYNAMIC SYSTEM BEHAVIOR

The dynamic behavior of the DDPS model was recorded on an event-by-event basis for each of the simulation runs, in the form of history printouts. As expected, all runs show a continuing conflict among the cyclic processes which were synchronized on 40 ms clock pulses (see the graph of the timeline in Figure 2-2). Since the Software Interface Processor (AIE) has highest priority, it always starts the cycle and initiates ICC transmissions, after which it enters a waiting state. This gives the Fast Cycle Executive (GEF) an estimated 1 to 2 ms to perform before AIE resumes and completes. Following AIE completion for a cycle, GEF runs to completion (it involves not waiting for transmission and hence does not provide an opportunity for lower priority processes to use the CPU until it completes). Upon its completion, the Minor Cycle Executive gains control of the CPU until its completion. This sequence of activity is estimated to require between 12 and 18 ms of the 40 ms cycle, depending mainly on the activity of GEF.

If the assumption is made that the AIE waiting interval is insufficient to permit all GEF I/O to be initiated, then the uninitiated remainder will be deferred for approximately 4 ms until AIE completes. This may be expected to cause some Read requests to be shifted back and forth between the interval and the completion period of GEF in successive cycles. Such a condition would strain or exceed the software systems performance requirements set forth in the Computer Program Development Specification, Volume 1, Book 2, Level A Software (Reference 7). Such variations in reading do occur in the simulations.

Start and completion times for the remainder of the scheduled processes vary as a function of the applied workload. Start and end variations for these tasks are tabulated for two computer runs in Tables 2-2 and 2-3. Each start (or end) variation is determined from the history printouts by subtracting the time of the triggering event (e.g., keyboard input) from the start (or end) time. Table 2-2 shows the result of a typical loading for a 1.1 second simulated flight segment of ALT. Table 2-3 shows results for a 1.24 second period which encompasses Separation.

The first 40 ms cycle is excluded from the derived statistical measures. In fact, the heavy activity of the first 40 ms cycle will recur every 16 seconds, as the cycles of the various processes are in phase at 16-second intervals. Process activity during such periods is depicted graphically in Figure 2-3.

System Management Data Acquisition (SDA) operates on a 50 ms cycle, and hence conflicts with the high priority cyclic processes every fourth cycle. Thus, its initiation (and completion) may be deferred as much as 14 ms, with an average observed variation of 3.5 ms and a standard deviation of 5.3 ms under normal loading. With a heavier loading as shown in Table 2-3, the average delay rises to 4 ms, with a maximum of 18 ms.

The Mated/Drop Executive (GEM) also experiences longer delays in starting under the heavier workload ranging from an average of 14.8 ms to 15.8 ms, although the maximum delay remains 17 ms. The delays are consistently in the range of 13 to 17 ms, and produce a relatively small standard deviation of 1.5 to 1.8 ms.

The MCDS Input Processor (DMI) was able to complete its function within 19 ms of activation in all instances of simulated input. This is within 10% of its cycle period. The User Interface Control Supervisor was generally able to respond to the keyboard inputs within 8 ms, with an average response time of

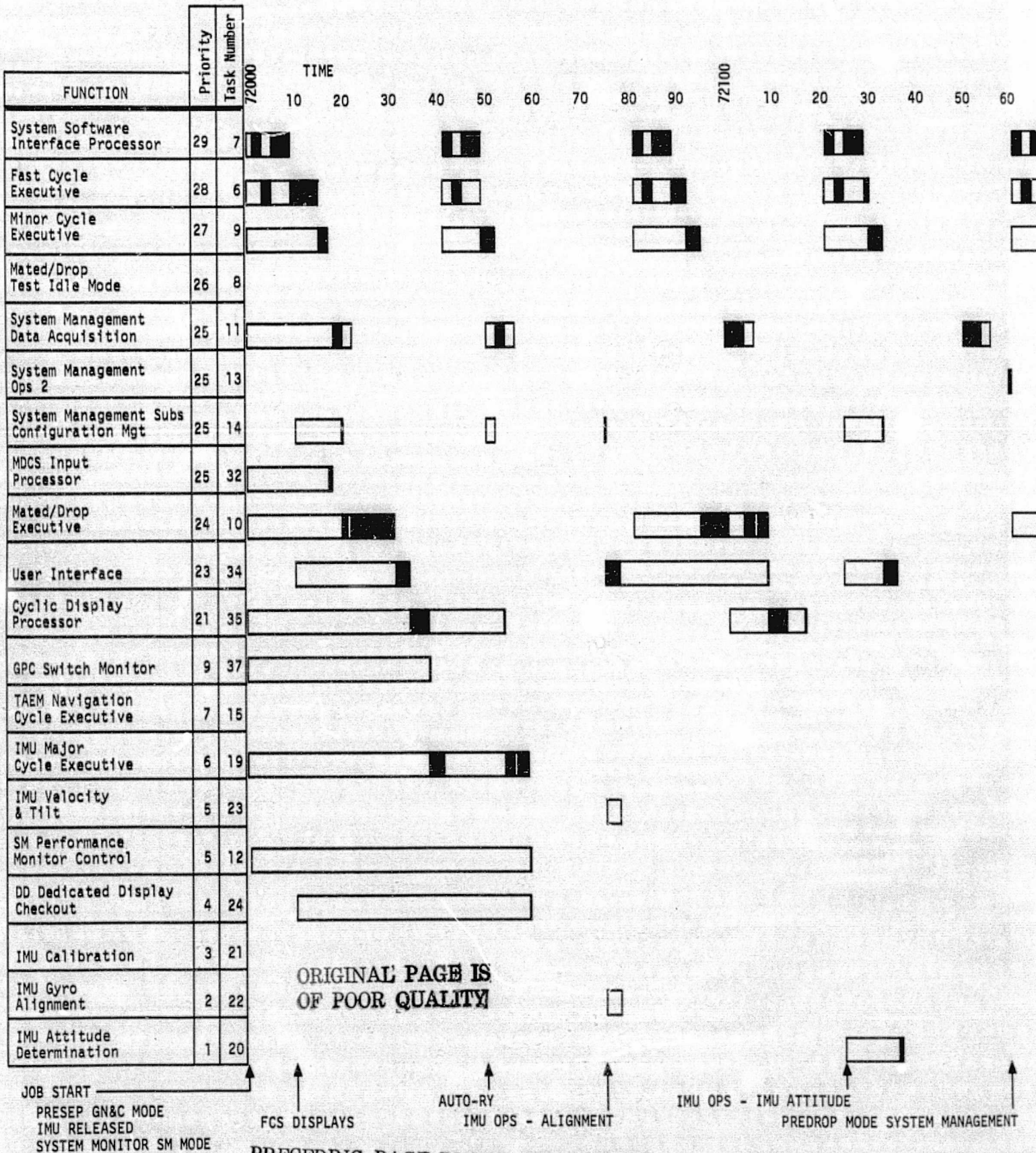

Figure 2-2. Timeline Graph of Cyclic Tasks

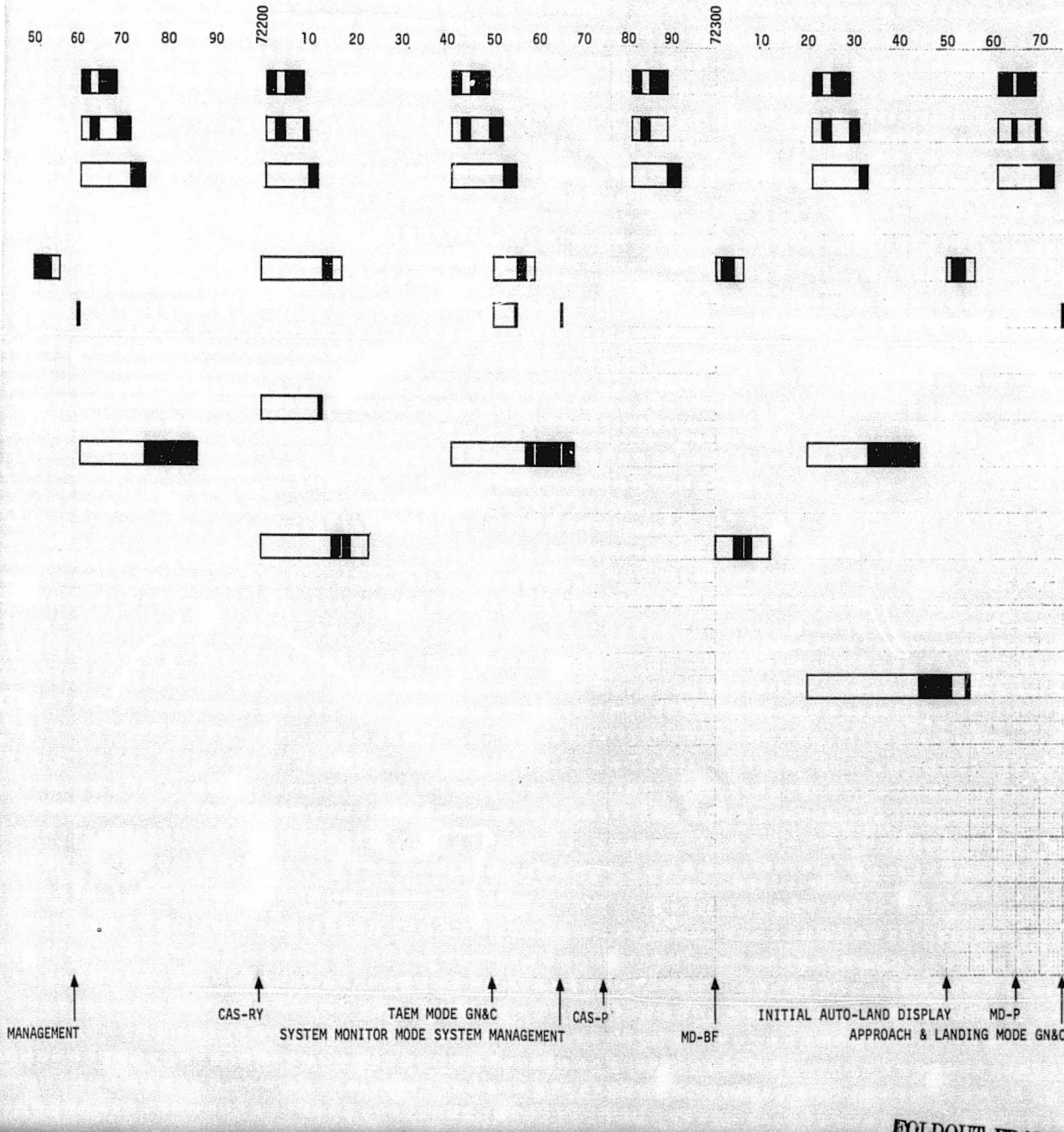

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Table 2-2. Time Variations for Processes, Schedule JSCA06

	80 ms Cycle				50 ms Cycle						Irregular		
	GEM(80)		GMG(320)		SDA(50)		DCI(100)	DMI(200)	SDM(500)	ARA(1000)	SFO	DMC	
	Start	End	Start	End	Start	End	End	End	End	End	End	Start	End
	21*	32*	62	70	18*	23*	62*	19	70		8	22*	25*
	15	29			0	6				23	0	4	6
	15	26			0	6	35				0	0	34
	16	27			0	6					0	8	11
	14	25	27	57	13	18	30	14			0	0	26
	17	28			3	8					0	0	18
	13	26			0	6	16					0	28
	13	23			0	6						3	5
	16	27	27	35	14	19	40	15				5	5
	13	24			1	6						0	10
	16	27			0	6	14		14			0	10
					0	6						0	10
			13	21	12	17	27	13				22	24
					3	8						0	18
					0	6	16					0	10
					0	6							
					13	18	54	14					
					1	6							
					0	6	17						
					0	6							
					11	16	26	12	26				
					2	7							
Avg.	14.8	26.2			3.5	9	27.5					3	15.4
S.D.	1.5	1.8			5.3	5	12.8					6	9.4

*Data from the first cycle, on a 16-second period, are not included in Average Delay and Standard Deviation.

Table 2-3. Time Variations for Processes, Schedule JSCA07

	80 ms Cycle				50 ms Cycle						Irregular		
	GEM(80)		GMG(320)		SDA(50)		DCI(100)	DMI(200)	SDM(500)	ARA(1000)	SFO	DMC	
	Start	End	Start	End	Start	End	End	End	End	End	End	Start	End
	21*	32*	62	70	18*	23*	62*	19	70		8	22*	25*
	15	29			0	6				23	0	4	6
	15	26			0	6	35				0	0	34
	16	27			0	6					0	8	10
	15	26	26	39	13	18	30	14			0	0	26
	17	28			3	8						0	18
	14	28			0	6	16					0	28
	14	25			0	6						0	10
	17	28	28	36	14	19	56	15				0	10
	14	25			1	6						0	29
	17	28			0	6	20		20			4	6
	14	28			0	6						0	16
	15	26	26	34	12	17	62	13					
	17	28			4	9							
	15	26			0	6	16						
	17	28			0	6							
					14	19	40	15					
					0	6							
					0	6	20						
					0	6							
					18	23	33	19	33				
					4	9							
					0	6	16						
					0	6							
					14	19	40	15					
Avg.	15.8	27			4	9.6	32					1.5	17.6
S.D.	1.8	1.3			6.2	5.8	16					2.7	10.1

*Data from the first cycle, on a 16-second period, are not included in Average Delay and Standard Deviation.

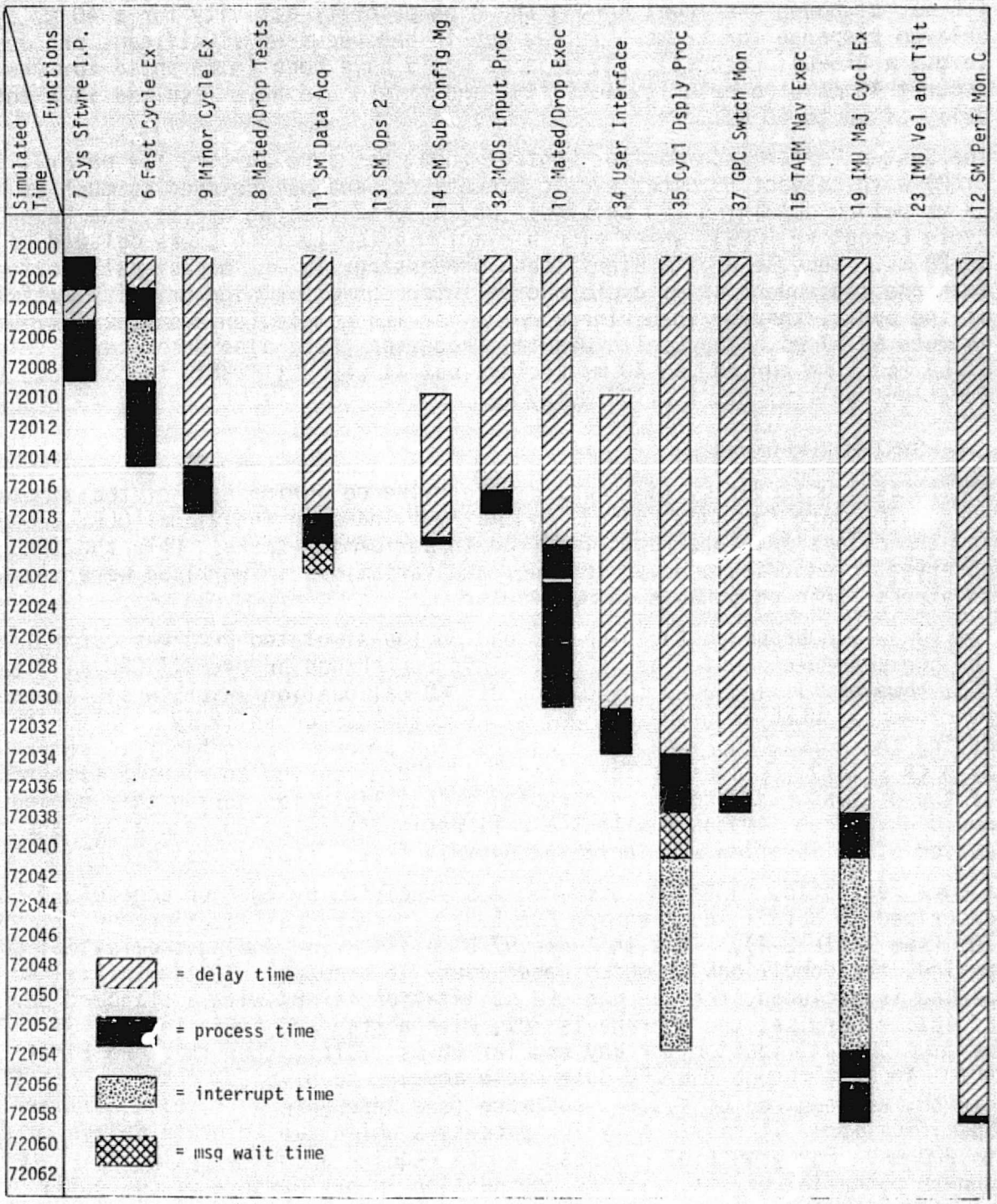

Figure 2-3. Delay Time for Functions Due to Priority

1.5 ms, although one input during the high-priority activity for a 40 ms cycle delayed response for 22 ms. If the key-in had required significant processing (e.g., a DISPLAY request), the process would have been interrupted for the subsequent 40 ms high priority activity, and this would have resulted in a total delay of up to 40 ms.

The System Performance Monitor Control (SDM) has a relatively low priority (122) with respect to other cyclic executives, and was delayed as much as 33 ms before obtaining CPU service. During peak loading cycles, the Major Cycle Executive (GMG), which also has a low priority (114), was delayed as much as 28 ms. Because of its significant processing, it may occasionally extend into the subsequent 40 ms cycle and be interrupted for high-priority activity of the cycle, thereby incurring a delay for its completion from the optimum by as much as 51 ms. The Cyclic Display Processor (DCI) also encountered delays of up to 50 ms during two 40 ms cycles, but it was still able to complete its functions well within its 100 ms cycle.

2.4 SYSTEM PERFORMANCE

Statistical data for system loading were gathered during each of the simulation runs. The data included average and maximum loads on individual DDPS components and the delays and interrupts incurred in performing tasks. Only the CPUs were observed to experience heavy loading, and variations in workload were introduced to stress these components in particular.

The run which produced the highest load on the simulated DDPS was controlled by the job schedule denoted as JSCA05. This run showed an overall CPU utilization of 75%; however, it included invocation of IMU calibration which, while apparently not precluded by GN&C software design, is nevertheless an unlikely load for the DDPS during the Mated/Drop Test. The calibration process was subject to interruptions by high priority processes for a total of 178 ms during an elapsed time of 240 ms. If the processor had not been occupied with calibration during this period, it would have been 74% busy; with the calibration, it was 100% occupied, and the period of calibration was increased by 287% (i.e., from a possible 62 ms to 240 ms).

A more realistic, high-load scenario was specified by the job schedule JSCA07, described in detail in paragraph 5.2.5.3. Processor utilization for this run was 70% (see Table 2-4). This includes 97.5% utilization during the initial 80 ms period, the conditions of which recur every 16 seconds. If the initial 80 ms period is excluded, the average CPU utilization is 68% with a standard deviation of 10%; otherwise, the average is 70%, with a standard deviation of 13%. The maximum CPU utilization for any regular 80 ms cycle (other than the first) is 88%. Thus, although the CPU duty cycle appears to have 30% reserve capacity for growth, as required of systems software (see Reference 7, Level A Software Specification), it exists only for processes which can tolerate delays of up to 200 ms. For growth of processes which require an 80 ms cycle, only 10-12% growth potential exists, without degradation in performance of currently defined processes.

Table 2-4 provides a synopsis of the CPU utilization by 80 ms time slices. It gives the idle periods in ms and processor utilization % for each of the 80 ms

Table 2-4. CPU Activity for JSCA07

80 ms Cycle Number	Cycle Start Time (ms)	Idle Periods (ms)	% Busy
1	32001	2	97.5
2	32081	16	72.5
		2	
		4	
3	32161	10	87.5
4	32241	13	67.5
		8	
		5	
5	32321	1	67.5
		1	
		1	
		8	
		15	
6	32401	25	68.8
7	32481	1	65
		20	
		2	
		5	
8	32561	15	65
		13	
9	32641	5	76.3
		9	
		5	
10	32721	6	48.8
		2	
		5	
		28	
11	32801	1	65
		2	
		25	
12	32881	1	66.3
		19	
		2	
		5	
13	32961	7	81.3
		8	
14	33041	13	66.3
		9	
		5	
15	33121	5	50
		2	
		5	
		28	
Average with Initial Cycle			70.0
Standard Deviation with Initial Cycle			12.5
Average without Initial Cycle			67.7
Standard Deviation without Initial Cycle			10.3

time slices indicating their cycle start times. It also gives the average CPU utilization percent and standard deviation with and without the initial 80 ms heavy load period. These figures are graphically depicted in Figure 4-2, CPU utilization per 80 ms regular cycle.

The transport lag for the highest rate flight control functions was not specifically investigated. However, it is apparent that no significant time is spent in transmitting either way between the MDMs and GPC memory because of the high data transfer rates of the MDMs and buses, and because flight-critical buses are dedicated for these transmissions. If delays do occur, it would be the result of contention between the Fast Cycle Executive and the System Software Interface Processor for the CPU, or of excessive computational requirements for the Fast Cycle Executive. The latter computational requirement is estimated to be less than 15.8 ms in the worst case. Although it should be possible to organize computation for the Fast Cycle Executive so that critical output occurs earlier in the process, it should be noted that this time exceeds the limit of 15 ms specified in Reference 7, the Level A Software Specification. The System Software Interface Processor is estimated to require a maximum of 3.7 ms per cycle and may have serious impact on the transport lag if allowed to interrupt the Fast Cycle Executive. The Fast Cycle Executive may be further delayed if it performs concurrently with ICC data transmission. This transmission reduces memory accessibility to the CPUs by one third; if the transmission requires 2 ms, concurrent processing time is increased by 0.67 ms.

Loading of other components and traffic on buses can generally be characterized as light. The nature of the bus network, and the configuration of DDPS components essentially eliminates data traffic congestion. The most heavily loaded buses and bus terminals, as indicated by simulation summary statistics, are:

PCMMU #1 and its bus (IP1)	18% utilization
ICC buses	15% utilization

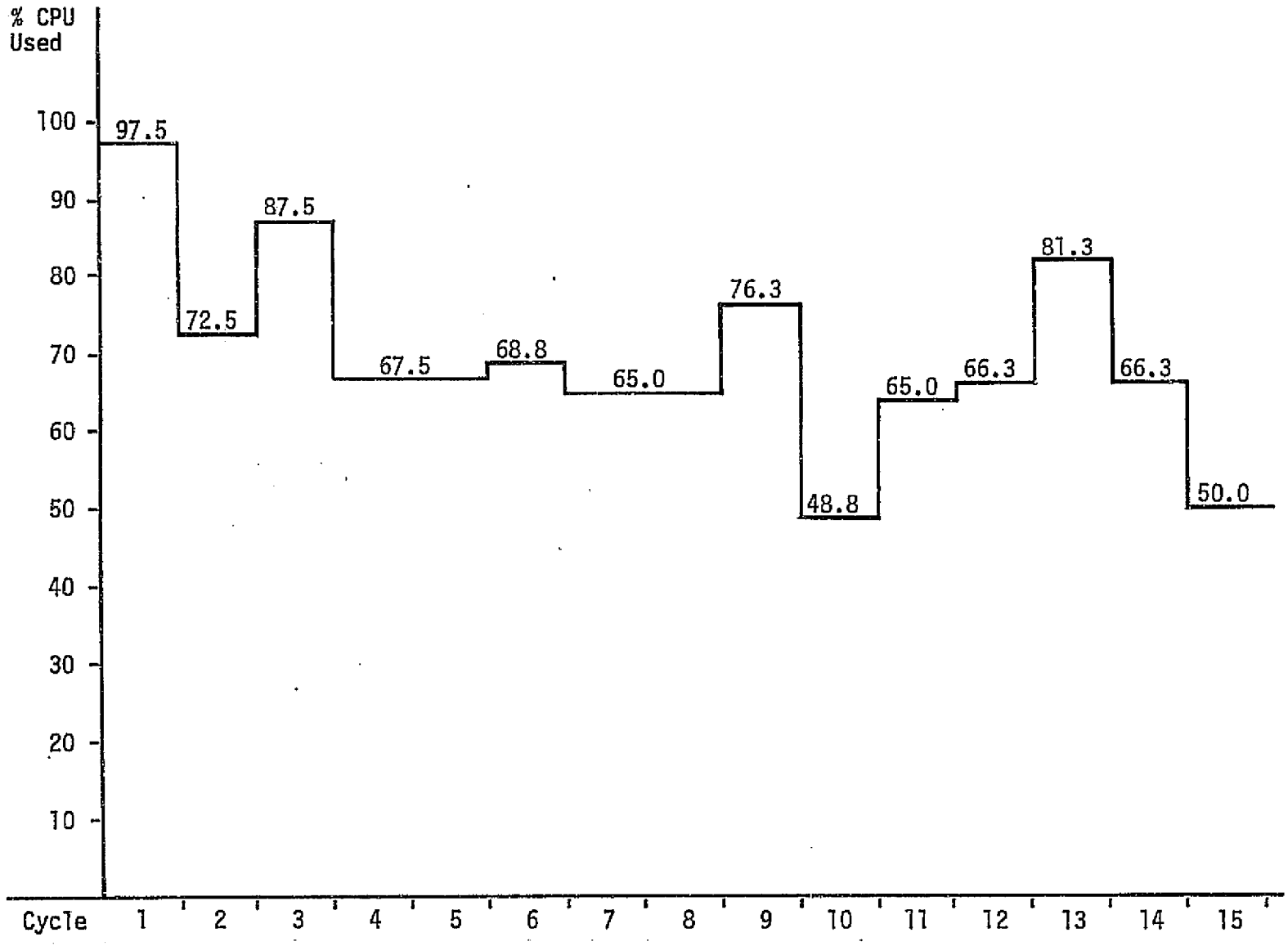

Figure 2-4. CPU Utilization per 80 ms Regular Cycle

3. CONCLUSIONS

3.1 SYSTEM CAPACITY

The CPU duty cycle of each computer appears to have a 30% reserve capacity for the major cycle (assumed to be 320 ms) as required. For processes having an 80 ms cycle, reserve capacity is estimated at 10%.

The databus network is only lightly loaded and is configured so that virtually no message congestion occurs. The ICC buses operate at capacity during memory to memory transmission and impose the most significant I/O loads on memory during a period of every 40 ms cycle; however, this is estimated at 30% of memory cycles for 5% of the time, or 1.5% of the capacity for memory access. Data buses are estimated to have reserve capacity for transmission in excess of 80%.

In summary, the capacities for processing and data transmission of the GPCs and the databus network appear adequate to support the Approach and Landing Test.

Memory capacities were not studied. See Section 3.3 for discussion on this subject.

3.2 RESPONSE CHARACTERISTICS

Since the System Software Interface Processor is assigned the highest priority of scheduled processes, it is executed on schedule and can respond to I/O completion with virtually no delay. Offset adjustments in the schedules for the second and third highest priority cyclic processes - the Fast Cycle Executive and the Minor Cycle Executive - should make it possible for both of these processes to execute on schedule, and for the Fast Cycle Executive to respond immediately to I/O completions.

Response of other processes generally deteriorates as priority decreases. Delays in completion of 25 - 35 ms are typical, although these can probably be reduced by 10 ms through offset scheduling for the cyclic processes. Delays of 40 - 70 ms were experienced in completing longer-running processes (i.e., Cyclic Display Processing, Performance Monitoring, and IMU Major Cycle Processing) because they overlap two successive 40 ms cycles and were subject to interruption by the high-priority processes of the second cycle.

Only the high-level timing requirements set forth in Reference 7, the Level A Software Specification, were considered in determining the suitability of the response characteristics indicated by simulation; the applications software function timing requirements, which were mentioned in this reference as being specified in Level B CPDS documents, were not available at the time of the requirements analysis. Performance of the functions of the Fast Cycle Executive can be made virtually independent of other processes by priority and scheduling offsets, and is therefore only determined by the programming of functions executed for the process and the dispatching algorithm used in calling the functions. Variation in initiation and input times can probably be confined within the specified limits, but it is not clear that lag time for flight control functions is less than the required 15 ms period.

A cursory study of the just-received Detailed Software Design Specifications for GN&C (Reference 29) indicates that significant effort has gone into design of the Fast Cycle Executive to minimize its response times. However, this document was not received by SDC prior to the completion of the analysis phase of this contract, and this information was not subjected to detailed analysis, nor was it used in modeling and simulation of the DDPS.

3.3 ADAPTABILITY

The DDPS design, as specified in the Level A Software Requirements (Reference 7), limits the scope of the software to meet mission requirements, but does not impair the capability for adaptation to new requirements and changing environmental conditions. On the contrary, such capabilities are explicitly incorporated in design specifications. The concepts of hierarchical software structure, modular coding, and centralized data base and dispatching control provide great flexibility for adapting the software to meet new demands. The traceability provided by design specifications enables the tracking of data elements from source to destinations and the tracing of program logic through the software structure. It appears to be relatively easy to locate and change any portion of the software and to determine impact on the remainder of the system. Additional logic can readily be "plugged in" to the system, insofar as programming and data manipulation are concerned.

Changes or additions to the software which affect the critical timing of DDPS software pose special problems. As discussed in the Software Analysis (Section 2.2), special features have been incorporated in the software design to facilitate tuning of the system to meet the real-time requirements of Shuttle Orbiter missions. The scheduling and dispatching facilities appear admirably suited to meet these needs, and to accommodate future requirements as they become known, without necessitating changes to the basic software structure or to logically disassociated functions.

The most severe constraint on adaptability of the DDPS appears to be the amount of main memory available for the GPCs. The Level A Software Requirement specifies a 15% reserve capacity to be retained in main memory for growth. SDC did not investigate memory requirements for software since dynamic loading of software is not performed in the ALT; in any case, data software sizing was not available for most of the applications modules. However, on the basis of SDC's previous experience with similar system development, it is reasonable to expect difficulty in maintaining the specified reserve.

The DDPS design specifications provide for system parameterization and control interfaces which essentially establish a logically open-ended system. The upper-level structure and components of the software are rigidly specified Operational Sequences, Modes, and Displays, but the provisions for Specialist Functions and Item inputs act as escape clauses to permit additional facilities to be incorporated. The options and electives for system control should be itemized as requirements in the Level A Software Specification and corresponding checks should be incorporated in the software to prevent undefined system status or inconsistent processes

from being established. For example, as noted in Section 2.4, IMU calibration was simulated during flight phase although this is ostensibly a preflight process. This was done because analysis of the design specifications did not uncover software checks which would preclude activation through an option of the IMU Specialist Function.

With the above mentioned qualification, the software is readily adaptable to future requirements.

4. RECOMMENDATIONS

The following recommendations have evolved from extensive analyses of the results of these simulations, and also reflect detailed SDC studies of the proposed hardware and software structures that preceded these modeling efforts.

4.1 DDPS CONFIGURATION RECOMMENDATIONS

a. The estimated 10% expansion margin for 80 ms cycle processes may not be adequate. The possibility should be examined, and both effects and remedies for inadequacy should be detailed. Additional simulations should be performed as neccessary to verify these remedies.

b. The memory space requirements of the software should be monitored closely during development. If the required 15% reserve is infringed upon, efforts to reduce space requirements should be concentrated on changes in program organization and algorithms; coding techniques and shortcuts which stretch or break the rules for DDPS software development (i.e., rules regarding structured programming and compool-defined data) will degrade its adaptability and interfere with subsequent maintenance.

c. Greater control over process scheduling and response characteristics can be achieved through the use of counters to record event occurrences, instead of simple flipflops. An example of the need for this capability is evidenced by the phase counts employed by the hybrid dispatcher to control module execution on multiples of the basic cycle of a process. This concept should be incorporated as a fundamental design specification and employed liberally for frequent synchronous and asynchronous events. Note that it is not necessary to reduce or reset such counters during the mission. They may be tested against threshold values which can be continually raised by 1, 2, 8, or any number to cause response at the desired multiple of the event occurrence. This not only serves the purpose of the hybrid dispatcher, but allows self checking by a module to determine if it is missing cycles because of time and priority constraints.

d. As discussed in Section 3.3, more checks should be specified and incorporated in the software to ensure proper keyboard inputs for the system state. "Software Design Specification - Part II: Approach and Landing Test (ALT) Detailed Design Specification - Guidance, Navigation, and Control" (Reference 29) indicates the possibility of placing the system in an "unknown and unverified state". Furthermore, even theoretically legal requests may activate functions which are not consistent with the mode or phase of the mission. To deal with these problems, legality and reasonableness checks should be incorporated in the User Interface software. Such checks could improve reliability and aid flight personnel in interacting with the DDPS, and would expand design specifications to close loopholes in requirements which might be

inadvertently used as a convenient, but unsystematic, adaptation of the software system to meet unforeseen demands. SDC recommends that attention be directed to a study of this area.

e. System tuning is necessary to meet critical response requirements, and has been planned for in the design specifications. SDC recommends that as much tuning as possible for dynamic functions be performed through the use of computer simulation, prior to completion and exercise of actual software. Use of scheduling offsets, priority changes, dispatching, etc., can readily be tested in a variety of combinations prior to experimentation with the real system.

4.2 AUGMENTATION OF SIMULATION EFFORTS

a. The dynamic, discrete simulation model of the DDPS was developed by SDC to fulfill the objectives of the DDPS study. Its operation has been verified and validated against requirements and currently available performance data. SDC recommends its continued use as a device for experimenting with scheduling algorithms and applied workloads for the DDPS under a variety of conditions which would be difficult or impossible to create for the actual system. The monitoring and reporting facilities of the model could not be effectively incorporated in the real system; no other approach can enable system designers to obtain more insight into the dynamic behavior of the DDPS during its development. Use of the model also provides project management with an overview of the dynamic, as well as static, character of the DDPS.

b. Continued use of the model should include incorporation of up-to-date information on detailed design specifications, estimates of program module timing, and message lengths and frequencies, with emphasis on key functions such as GN&C. To accomplish an extended analysis of GN&C functions, most of the hardware specifications (IMSIM Forms 6 through 14) will remain unchanged, but virtually all of the software workload parameters (IMSIM Forms 2 through 5) must be redone completely. Efforts to be accomplished include aspects of the following activities:

1. Requirements analysis
2. Test design
3. Model adaptation and parameterization
4. Model execution
5. Test analysis and documentation

c. Further effort should be expended to determine the greatest stress situations which can develop during the ALT mission, and results should be employed in constructing workloads for the model. Additional conditions which should be investigated via simulation include system errors and component failures. These can be simulated according to precise schedules to achieve maximum impact.

(Page 4-4 Blank)

d. The model has direct application to the study of DDPS performance for missions and test phases. In particular, Operational Flight Test requirements for the DDPS need to be analyzed from a dynamic functional standpoint to determine behavior with an additional simplex mode GPC and software execution for new major functions and modes. The impact of additional dynamic loading for activities such as uplink-downlink and payload monitoring should also be investigated.

e. While the DDPS model is well suited to the investigation of dynamic functions at a resolution of 1 ms, it should not be indiscriminately used to represent all such functions of the DDPS. Functions which are independent of each other, or at least series-related, should be individually modeled as required to observe their individual behavior.

SDC has designed the DDPS model to represent the functions of the GPCs, the bus network, and bus terminals as an integrated system in which feedback is an essential characteristic. Localized activity, such as occurs in DEUs, IOPs, and PCMMUs, may normally have negligible impact on the DDPS operation at the 1 ms level of discrimination, but may still require simulation to determine situations in which they become saturated or otherwise loaded so as to change their operating characteristics and affect general system performance. The precise steps by which the Process Management component of the Flight Control Operating System monitors events and schedules processes should be simulated in detail to determine performance and dynamic loading conditions, and used as an aid in making systematic, effective improvements in scheduling algorithms and methods of implementation. In this manner, a variety of aspects of synchronous and asynchronous approaches can be evaluated effectively.

f. SDC also recommends that consideration be given to the construction of models of system components to study their behavior through simulation on appropriate time scales (e.g., to a microsecond level). Such models may be built using IMSIM, as was the DDPS model, or they may be constructed using the underlying general-purpose simulation package - MODLIT - upon which IMSIM is based. Both of these tools may be used to construct models which can be operated dynamically by discrete simulation to yield useful data on behavior under conditions which are difficult or impossible to duplicate in real systems. Furthermore, processes such as intercomputer communication may be represented at more than one level of time resolution in different models. For example, a fine-resolution model can be used to determine "macroscale" characteristics for inclusion in another model.

5. TECHNICAL DESCRIPTION

The following paragraphs describe in detail the objectives of the Dynamic Loading Analysis Study and the efforts performed under each of the tasks defined in Section 2.1 of the Statement of Work.

5.1 INTRODUCTION

High-speed digital computers have been increasingly applied to the analysis and design of complex systems. One of the most useful techniques for such applications is that of discrete simulation, in which the system is represented in the computer as a dynamic model which changes its state with the stepwise passage of simulated time.

The IMSIM model has been developed to aid in the investigation of systems which include computers. It is constructed upon the MODLIT Discrete System Simulator. In effect, IMSIM is a general model of a computerized transmission system, which can be tailored to represent a wide variety of configurations, components, and applied loadings. Furthermore, as a fully interactive model, it enables the user to monitor its behavior and to make dynamic modifications during simulation.

The objectives of the Dynamic Loading Analysis Study and the model goals are presented in paragraph 5.1.1. The guidelines and assumptions for the model development are delineated in paragraph 5.1.2. A brief conceptual overview of IMSIM is given in this introduction in paragraph 5.1.3, and the overall approach to the model development, applied workloads, and dynamic simulation is given in paragraph 5.1.4.

5.1.1 Objectives and Model Goals

The primary objective of the Space Shuttle Orbiter Digital Data Processing System Dynamic Loading Analysis effort was to investigate the dynamic behavior of the Orbiter's data processing subsystem during specific operational sequences, in order to identify and formulate resolution of potential problems for critical performance areas.

To meet this objective, the generalized IMSIM model was adapted and parameterized, so that the Space Shuttle's hardware and software functions were properly represented in this model.

The model goals were established as a result of the work performed under the Data Systems Requirements Definition task (Statement of Work task 2.1.1)

From a study of the overall dynamic hardware and software data flow requirements it was determined that the IMSIM model should be constructed within the following set of basic guidelines:

- The model should be configured so as to allow statistical data generation on the dynamic behavior of central processing units, which will be the focal point for analyzing system performance.

- Suspected potential data flow problem areas (defined by a Sensitivity Analysis) should be modeled such that data could be generated to determine if and/or to what extent these areas are critical in respect to system performance.
- The model should be designed for a specific operational configuration and include only that hardware and software required to simulate the functional dynamics required for that operation, i.e., Shuttle Orbiter Data Processing Subsystem characteristics such as operational reconfiguration, fail and fault redundancy, and BITE should not be incorporated in the model.

5.1.2 Guidelines and Assumptions

5.1.2.1 Model Guidelines. The following NASA specified guidelines for the IMSIM model were defined in a project coordination meeting held in August 1975 and in subsequent coordination communications:

a. The simulation model will be adapted, parameterized, and executed for the Approach and Landing Test (ALT) configuration for the Mated Flight/Drop Test.

b. The specific configuration to be simulated is the ALT Memory Configuration #2 as specified on page 6-15 of Computer Program Development Specification Volume I, Book 2 (revised) #SS-P-002-120A-1-System Level A Requirements, Software, (Reference 7) and restated in revision B, dated 26 September 1975.

c. A four-GPC redundant configuration with data paths to the multiplexer/demultiplexer (MDM) hardware level is to be simulated.

d. ALT Memory configuration #2 is to include the Downlist format #1, as specified on page 4-1 of Computer Program Development Specification, Volume I, Book 4, #SS-P-0002-140, Downlist/Uplink Software Requirements (Reference 9).

e. The GN&C Mated Flight/Drop Test OPS and the SM Flight OPS will be the operational sequences for the model.

f. Hardware units that will be excluded from the ALT configuration are as follows:

Ascent TVC Driver
Forward Reaction Jet Driver
Reaction TOT OMS Driver
Star Tracker and Light Shield
Network Signal Processor
S-Band Network Equipment
Doppler Extension
Payload Signal Processer

Rendezvous Radar
Transition Hand Control Unit
MDMs for LL, LR, and OT
Engine Interface Unit
Master Events Controller.

g. There will be no uplink capability for the ALT configuration. Downlink will be accomplished via a direct interface from the PCMMU to the S-band system. The downlink data rate will be at 128 Kbps.

h. The Downlist Data Controls Processor (DDC_DWN_LST_CONTROLS) will not be active during Mated/Drop Test.

i. The GPC/PCMMU Data Cycle Synchronizer (DCS_SYNC) will not be invoked during Mated/Drop Test.

5.1.2.2 Assumptions. Based on the NASA supplied guidelines, the Approach and Landing Test (ALT) Functional Design Specifications (References 18 through 21), and the ALT Computer Program Development Specifications (References 10 and 11), the following assumptions have been defined for the IMSIM model:

a. IOP control activity and its memory access for commands have negligible impact on system functions at the millisecond level of perception, and therefore is not simulated. Data transmissions are associated directly with the processes which initiate or process them.

b. Only the processes within one GPC are simulated, based on the assumption that virtually identical loading of the CPU occurs in all members of a redundant set. Simulation of activity in all GPCs would simply increase operating times for simulation and would yield no additional information.

c. The User Interface Control Supervisor is only simulated for MCDS messages and Applications service. Completion of MM I/O service is excluded.

d. For Cyclic Display Processing (DCI_CYC_DISPLAY) and New Display Processing (DMC_NEW_DISPLAY) I/O is not suppressed for any DEU, displays are never frozen, and output is always a full page (509 words).

e. The GPC Downlist Formatter (DCD_DOWNLIST) is assumed to be enabled.

f. The Launch Data Bus I/O Processor is not employed during the Mated/Drop Test.

g. The DEU Loader (AIG_DEU_LOADER) is not scheduled during Mated/Drop Test.

h. No change of state results from switches monitored by the GPC Switch Monitor (ARA_GPC_SWITCH).

i. The following System Control processes are not simulated because they are irrelevant to the Mated/Drop Test: ASA, ASB, ASC, ASD, AIB, ARB, ARC, ARH.

j. The computation associated with GNC OPS 2 Control Segment (GAA_OPS2_MATED_DROP_TEST) is included in the User Interface process (DMC_SUPER); hence, this process is not simulated as a task.

k. The Preflight OPS Control Segment (GAV_OPS1_PRE_FLT) is not invoked during the Mated/Drop Test and is not simulated as a task. The Preflight Executive which is scheduled during mode 101 of OPS 1 is also not simulated but the Fast Cycle Executive and the IMU Minor Cycle Executive are started prior to simulation of the Mated/Drop Test.

l. IMU Calibration is assumed to be performed with only one type of calibration at a time (i.e., GMT, GMU, or GMV).

m. The Control Segments for GMC Specialist Functions are assumed to involve negligible computation and are not simulated as tasks; they include GUA, GUB, GUC, GUG, GUH, GUI, AND GUK.

n. ALT memory configuration #2 can be accommodated in GPC memory with no capacity problems.

o. Task scheduling will be performed as follows:

   a) Processing is interruptible by the executive and critical tasks (IMSIM tasks of service class #1).

   b) Critical tasks have precedence and confiscation privileges over noncritical tasks in obtaining processors.

   c) Scheduling is determined by task priority.

p. All transmissions are to be over explicity defined data links and no implicit links are allowed.

q. The CPU will not be interrupted in performing a task in order to initiate and service I/O (this function is performed by the IOP of the DDPS).

r. A time resolution of 1 ms is sufficient for the investigation of DDPS processes as specified by the S/W.

s. Mass Memory Message Procecing (DMP_MM_MSG_PROC) is not used in ALT.

t. Reconfiguration does not occur in ALT.

u. MCDS Major function change does not occur.

v. CMPTR/CRT and CMPTR/BUS keys are not used in ALT.

w. The ITEM DATA key sequence is not used.

x. New displays are always sent to DEU1.

y. Three DEUs are updated by Cyclic Display Processing (DCI_CYC_DISPLAY).

z. The ICC Router (DME_ICC_ROUT) is referenced by the System Software Interface Processor (AIE_SIP).

aa. Each display update requires four scalar conversions and 10 item formattings.

5.1.3 Conceptual Overview of IMSIM

5.1.3.1 Hardware Representation. The equipment simulation categories used in IMSIM cover five basic types of equipment: memory units, storage units, computer processors, data transmission links, and a group called "devices" that includes all hardware not covered by the other four categories. Although there is no theoretical constraint upon the organization of processors and memory units, attempts by the computing industry to design control programs (operating systems) for various configurations of computers have resulted in the definition of a substructure for large computer systems. To realistically represent such systems for simulation, IMSIM includes the concept of the "virtual machine": a computer in which at least one processor can access all memory units. In its simulation runs, SDC has simulated the Space Shuttle's digital data processing system both ways, viz., as one Virtual Machine with four GPCs, and as four separate Virtual Machines.

Storage units and devices are generally considered as global (system-wide) system components, but can be viewed as local (to a virtual machine) when connected exclusively to a machine via data transmission links. Processors and memory units are always considered as local components. Data links are defined for use in connecting any components except processors, and have either local or global status, depending upon the configuration.

Inputs to IMSIM include the means for specifying characteristics for individual members of each of the component types mentioned, together with a description of the way in which they are to be configured. One other type of component is defined in IMSIM and is classified as hardware: the "data set". A data set may be viewed as a subdivision of a storage unit, and is intended to correspond to a file of data to be stored in the unit.

5.1.3.2 Software and Workload Representation. In order to study the dynamic behavior of a system representation by IMSIM, it is necessary to apply a load to the system. A workload structure has been incorporated in IMSIM which resembles that of the actual computer system. It includes general building blocks for rudimentary respresentation of computer programs and data and for describing data transmissions, and the means for organizing these elements into a hierarchical structure which is consistent with the hardware representation. The building blocks are denoted as routines, data blocks, and messages. These are combined into "tasks" which are units of work to be

performed by a single virtual machine. Tasks, in turn, are organized as a time-distributed network of steps which are collectively denoted as a "job"; a job is a unit of work to be performed by the overall system. This organization is depicted in Figure 5-1.

Routines and data blocks are always considered to be local elements of virtual machines, while messages may have either global or local significance, depending upon their individual characteristics and the hardware configuration. Inputs to IMSIM provide the means for specifying characteristics of individual elements, including constraints on assignment to virtual machines and sharability among concurrent tasks.

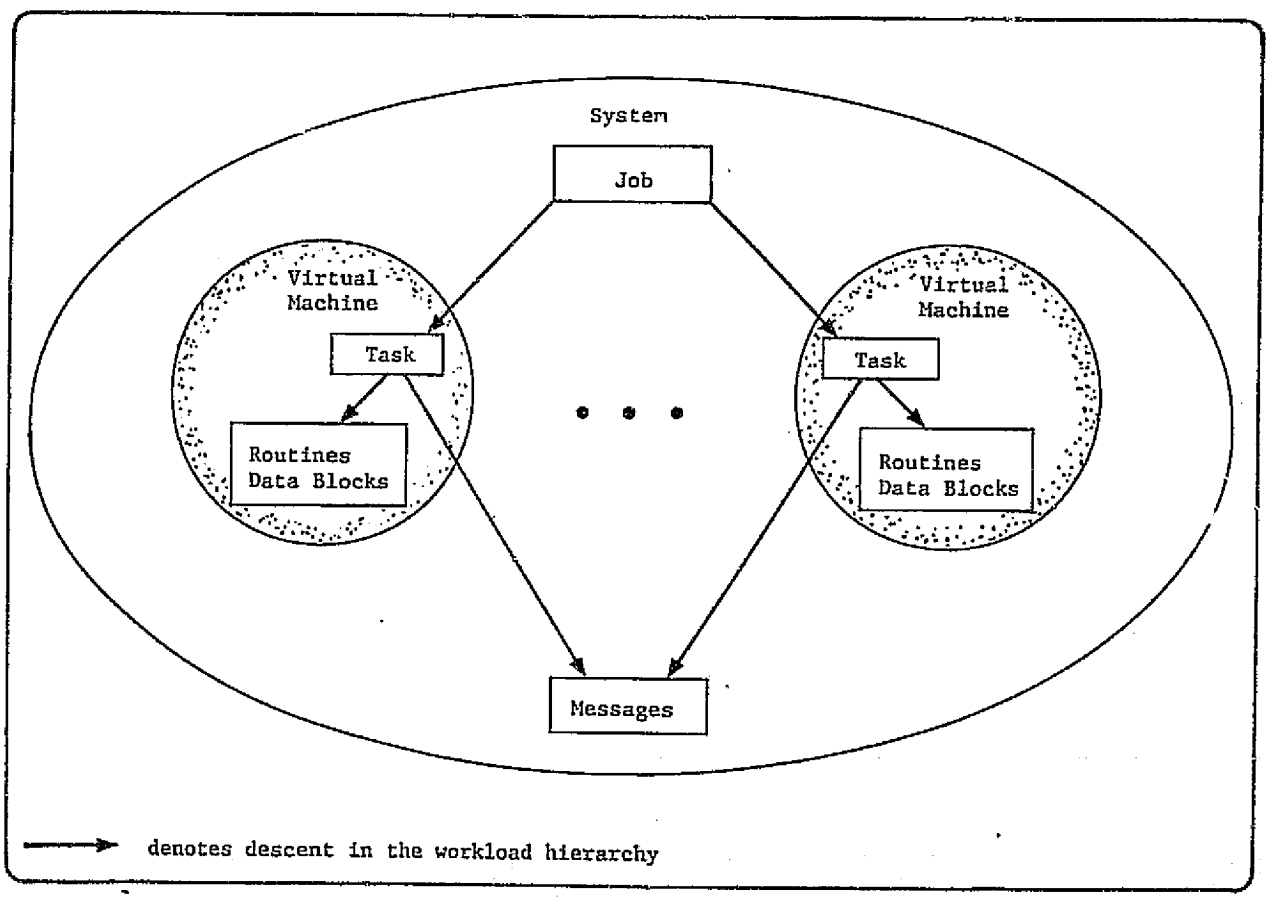

Figure 5-1 - Workload Structure in a Simulated System

5.1.3.3 Functional Description. The functional logic which is incorporated in IMSIM includes representation of hardware behavior, applications programs, and executive software. Distinguished system components - whether hardware or software - are represented by suitable MODLIT entities such as facilities and storages. Both the logic and the system components are generalized IMSIM capabilities which must be tailored to suit the system to be simulated. For this reason, IMSIM is designed to operate in two phases: initialization and simulation. In the initialization phase, IMSIM receives and processes "forms" which complete a system definition and describe a workload to be applied to the defined system during simulation. Certain system specifications can also be processed during simulation, thereby permitting the dynamic modification of the system.

The logic of IMSIM is expressed in terms of MODLIT logic blocks, and can be subdivided into eight sections:

a. Processing of input specifications

b. Processing of job requests

c. Task preparation

d. Task execution

e. Element space allocation

f. Message preparation

g. Message transmission

h. Task removal

The first of these constitutes the initialization phase. A portion of this phase together with the other seven sections, comprise the simulation phase.

5.1.3.4 Preparation of Model Specifications. This section describes the various specification forms which were used to complete the definition of IMSIM for representation of the Space Shuttle's DDPS and to define software and workload characteristics.

Each form is represented by one or more lines of input. Only the first 71 characters of each line are interpreted. Positions 1 through 70 contain the information to be read; position 71, if occupied by any character other than a zero, indicates that the next line in the input sequence is a continuation of the current line. Positions 72 through 80 are used for sequence numbers.

A double prime ('') in positions 1 and 2 or a quotation mark (") in position 1 indicates that the line is a comment which is used solely to annotate printed outputs. All input lines are interpreted on a free-field basis, i.e., one or more spaces separate successive fields.

The first field of each form contains an integer which identifies the form type. The layout line which follows the column headings line of each form description indicates roughly the magnitude of values for each field (e.g., nnnnnn) and signifies the optional use of a fractional value: nnn. means a fractional value is possible, while nnn means that only integer values should appear. If a fractional value is specified, it must be presented as decimal with at least one integer on each side of the decimal point, i.e., 5.01, 66.0, and 0.2 are legal but 5., 66., and .2 are not.

a. FORM 1 - JOB DEFINITION

Form	Job	Task Type	Priority	Nature	Go/NoGo	Immediate Predecessors
1	nn	nn	n	n	nnn	nn nn ... (to a maximum of 24)
E.G.						
1	2	6	1	1	1	
1	2	15	3	1	1	
1	2	8	1	1	1	6 15
1	3	6	2	1	377	

Job — The number of the job prototype being defined (Job 1 is reserved for the simulated executive.

Task Type — Each line specifies a job step - this field contains the number of the type of task for the step (see Form 2).

Priority — A number between 1 and 9, indicating the priority of the step; 9 is the highest priority.

Nature — A 3 in this field for any job step indicates that the job is cyclic (i.e., it repeats continuously); if the job is not cyclic, a 2 indicates that the step is cyclic; otherwise, a 1 should appear.

Go/NoGo — The number of a MODLIT variable whose value determines whether or not the step is to be performed; nonzero = Go, zero = NoGo.

Immediate Predecessors — The numbers of other tasks in the job which must directly precede the given step during performance, and which must be completed before the given step can start; there may be no predecessors.

b. FORM 2 - TASK DEFINITION

Form	Task Type	Service Class	Permissible Delay	Required Elements
2	nn	n	nnnnnnnnnn	nnnnn nnnnn ... (to a maximum of 100)
E.G.				
2	6	5	0	30007 30021 40055 40030 50020 50008
2	15	1	100	30008 40030 50010 50011

Task Type — The number of the task prototype being defined (Tasks 1 through 5 are reserved for the simulated executive).

Service Class
1 - critical; perform immediately (Permissible Delay is ignored).
2 - timely; becomes critical following lapse of Permissible Delay.
3 - timely; becomes noncritical following lapse of Permissible Delay.
4 - timely; discard if Permissible Delay elapses.
5 - noncritical (Permissible Delay is ignored).

Permissible Delay — A period in milliseconds commencing with job start (see Service Classes 2 - 4)

Required Elements — Identifiers of routines (see Form 3), data blocks (see Form 4), and messages (see Form 5) which comprise the task; identifiers are
300nn for a routine type nn
400nn for a data block type nn
500nn for a message type nn

c. FORM 3 - ROUTINE DEFINITION

Form	Routine	Share Class	Library Data Set	Size	Execution Time	Processor Class	Memory Residence	Computation Time		
								V	X44	X45
3	nnn	n	nnnnnn	nnnnnnnn	nnnnnnnn.	nn	nnnnn	nnn	nn.	nn.
E.G.										
3	7	1	110001	12000	600	1	70001	16	20	
3	21	0	366	3200	0	10	371	380		

Routine — The number of the routine type being defined (Routine 1 is reserved for the simulated executive).

Share Class — 1 if the routine can be shared among tasks; 0 if not.

Library Data Set — The identifier of the data set which is supposed to contain a loadable form of the routine (See Form 11), or the number of a MODLIT variable which is to be evaluated when loading occurs, to determine the identifier.

Size — The number of characters of memory space required for the routine.

Execution Time — The maximum amount of time (in milliseconds) that the routine will operate for a task; zero if no limit.

Processor Class — The level of processor capability required to execute the routine (See Form 9).

Memory Residence — The memory into which copies of the routine can be loaded, or zero if no restriction;

- 0 - load into any memory, as required for tasks
- nnn - evaluate variable nnn to determine memory identifier
- 700nn - the memory to which the routine is to be loaded

Computation Time — The number of a MODLIT variable to be evaluated whenever a transmission completes for a task, to determine the amount of computing (in milliseconds) to be spent in executing the routine; also, the values assigned to X44 and X45 for possible use as parameters in the given variable (they may be ignored).

d. FORM 5 - MESSAGE DEFINITION

Form	Message	Nature	Source	Sink	Length			Interval			Start Time	Total	Storage Effect	Trigger Domain
					V	X44	X45	V	X44	X45				
5	nnn	n	nnnnnn	nnnnnn	nnn	nn.	nn.	nnn	nn.	nn.	nnnnnnn.	nnnnn	n	n
E.G.														
5	8	0	60003	40030	16	20	0	16	0	0	0	1	0	0
5	20	1	50050	110002	388	200	15	16	70	0	0	0	1	0
5	31	0	397	398	399	0	0	16	20	0	100	0	0	1

Message — The number of the message type being defined (Messages 1 through 5 are reserved for the simulated executive).

Nature
- 0 - frequency of transmission (see the Interval field) is dependent upon task execution; a separate transmission sequence is established for each task.
- 1 - message transmission is shared among tasks and occurs independently of task execution, but transmissions may accumulate.
- 2 - message transmission is shared among tasks and occurs independently of task execution, but if a transmission is not started prior to the next transmission due for the message, the transmission is lost.

Source
Sink — The identifier of a defined unit which is suitable for use as a source or sink, or the number of a MODLIT variable to be evaluated whenever the messsage is to be transmitted, to determine the identifier:

nnn - variable number	60nnn - device (See Form 6)
40nnn - data block (see Form 4)	70nnn - memory (See Form 7)
50nnn - message (used only as a source)	110nnn - data set (See Form 11)

Length — The number of a MODLIT variable to be evaluated whenever the message is to be transmitted, to determine the length (in characters) of the transmission; also, the values assigned to X44 and X45 for possible use as parameters in the given variable (they may be ignored).

Interval — The number of a MODLIT variable to be evaluated whenever a transmission of the message (or triggering message if appropriate) completes, to determine a time interval (in milliseconds). If Source is a message, this is the time between completion of the triggering message and the start of the response; if the Source is not a message, this is the time between successive transmissions of this message. X44 and X45 are used as in the Length field; the Interval field is ignored if Total is 1 for a nontriggered message.

Start Time — The period (in milliseconds) which must elapse before the message can be transmitted; measured from the start of a task if Nature is 0, or else from the start of the job.

Total — The number of transmissions of the message; 0 if no limit.

Storage Effect — 1 if transmissions is to change the size of a source or sink data set by the length of the message; 0 if no effect is wanted.

Trigger Domain — Applies only to messages triggered by other messages; 0 if any transmission of the trigger message is to trigger this message; 1 if only transmissions related to the task are relevant to this message.

e. FORM 6 - DEVICE DESCRIPTION

Form	Device	A/D	Share Class	Record Size	Transmission Rate		Reset Period
					Input	Output	
6	nnn	n	n	nnnnnn	nnnnn.	nnnnn.	nnnnn.
E.G.							
6	1	1	0	0	10	10	3
6	12	1	1	800	5	6	1

Device — The number of the device being described.

A/D
1 - digital
2 - analog
3 - digital to analog
4 - analog to digital

Share Class
0 - can only be assigned to one task at a time
1 - can be shared among tasks

Record Size — Limits the length of a transmission by truncating it, if necessary, to the number of characters indicated; zero if no limit on record size.

Transmission Rate — The rate (in characters/millisecond) at which data can be received (Input) or sent (Output) by the device.

Reset Period — The time (in milliseconds) required by the device to recover from a transmission before it can start another.

f. FORM 7 - MEMORY UNIT DESCRIPTION

Form	Memory Unit	Speed Factor	Number of Pages
7	nnn	nnnn.	nnnnn
E.G.			
7	1	1	256
7	2	0.25	1000

Memory Unit — The number of the memory unit being described.

Speed Factor — The ratio of the memory access rate to a nominal rate of 1 character per microsecond; e.g., "2.5" indicates an access rate of 2.5 characters/microsecond.

Number of Pages — The number of virtual machine pages (see Form 14) which constitute the capacity of the memory unit.

9. FORM 8 - STORAGE UNIT DESCRIPTION

Form	Storage Unit	A/D	Share Class	Cycle	Transmission Rate	Capacity	Access Period					
							V	X44	X45	X56	X57	
8	nn	n	n	nnn.	nnnnn.	nnnnnnnn	nnn	nn.	nn.	nn.	nn.	
E.G.												
8	1	1	1	0	8.2	1000000	16	5				
8	2	1	0	25	12.1	500000	388	20	5			

Storage Unit — The number of the storage unit being described.

A/D — 1 - digital
2 - analog

Share Class — 0 - can only be assigned to one task at a time.
1 - can be shared among tasks.

Cycle — A zero indicates that the storage unit is noncyclic; i.e., it is in motion only during transmission operations (e.g., a tape). A nonzero value indicates that the storage unit is cyclic (e.g., a disk or drum) with a period in milliseconds as specified by the value.

Transmission Rate — The rate (in characters/millisecond) at which the storage unit can send or receive data.

Capacity — The number of characters which the storage unit can accommodate.

Access Period — The number of a MODLIT variable to be evaluated whenever the storage unit is to be accessed, to determine the time (in milliseconds) that is to be spent in locating the data (or place for the data) to be transmitted; also, the values assigned to X44, X45, X56, and X57 for possible use as parameters in the given variable (they may be ignored). Note that X44 must be in milliseconds if Cycle is 0.

h. FORM 9 - PROCESSOR DESCRIPTION

Form	Processor Unit	Speed Factor	Class	Interrupts	Task Switch Period	Virtual Machine	Connected Memory Units
9	nn	nnnn.	nn	n	nnnnn	n	nn nn ... (to a maximum of 20)
E.G. 9 9	1 2	1.5 0.9	10 11	5 0	2 4	1 1	1 2 5 1

Processor Unit — The number of the processor being described.

Speed Factor — The ratio of the processor operating speed to a nominal rate of 1 instruction per microsecond; e.g., "1.5" indicates a processing rate of 1500000 instructions per second.

Class — A number used to match routines (see Form 3) with appropriate processors; classes 1 through 9 have related capabilities such that 1 is a subset of 2, 2 is a subset of 3, etc. There are no implied capability relations concerning classes 10, 11, etc.

Interrupts — A number which indicates the types of interrupts to which the processor can respond:

0 - none
1 - I/O
4 - job and task initiation requests
5 - all

Task Switch Period — The time (in milliseconds) required for the processor to drop one task and commence another, as a consequence of an interruption.

Virtual Machine — The number of the virtual machine (see Form 14) to which the processor belongs.

Connected Memory Units — The numbers of memory units (see Form 7) which are addressable by the processor; all of the memory units must belong to the same virtual machine as the processor.

i. FORM 10 - DATA LINK DESCRIPTION

Form	Data Link	Mode	Transmission Rate	Time Lag
10	nnn	n	nnnnn.	nnnn.
E.G.				
10	5	0	10	0
10	306	1	2	0

Data Link — If less than 100, this field contains the number of a half-duplex communication channel. If greater than 100, it signifies a multiplexed set of half-duplex subchannels; the set number is given by the 100's digit, and the number of subchannels in the set is given by the last two digits (e.g., "230" would define a multiplexed channel number 2, consisting of 30 subchannels).

Mode — Applies only to multiplexed data links:
0 - the subchannels are completely independent of each other.
1 - the channel will operate in "burst mode" if any of its subchannels is subjected to a load in excess of the specified transmission rate. This will cause interruption of any other transmissions in progress on the data link, and may result in data loss.

Transmission Rate — The maximum rate (in characters/millisecond) at which the link operates; in the case of a multiplexed channel, it is the rate for each subchannel.

Time Lag — The period (in milliseconds) between sending and receiving one unit of data.

j. FORM 11 - DATA SET DEFINITION

Form	Data Set	Storage	Organization	Initial Size	Maximum Size
11	nn	nn	n	nnnnnnnnnn	nnnnnnnnnnnn
E.G. 11 11	 1 66	 3 12	 0 1	 0 10000	 1000000 5000000

Data Set — The number of the data set being defined.

Storage — The number of the storage unit (see Form 8) on which the data set resides.

Organization — 0 - the data set is serially addressed.
1 - the data set is randomly addressed.

Initial Size — The number of characters in the data set when simulation commences.

Maximum Size — The maximum space (in characters) reserved for the data set on the specified storage unit.

k. FORM 12 - CONFIGURATION SPECIFICATIONS

Form	Unit	Data Link Connections
12	nnnnn	nnn nnn nnn ... (to a maximum of 96)
E.G.		
12	60002	1 23 73 202 203
12	70011	200 300
12	80006	5 6 7 8 9

Unit — A 5-digit identifier of a memory unit (see Form 7), a storage unit (see Form 8), or a device (see Form 6) which is to be connected to specified data links (e.g., 60002 specifies device 2).

Data Link Connection — The numbers of data links (see Form 11) to which the given unit can be connected for message transmission. Independent channels are represented by their respective numbers. A particular subchannel of a multiplexed channel is represented by specifying the set number of the channel as the 100's digit, and the ordinal number of the subchannel in the set as the last two digits (e.g., 209 for the ninth subchannel of set 2); all subchannels of a multiplexed channel are represented by the set number as the 100's digit and 00 for the last two digits.

Any units which do not share some data link can be assumed to share an implicit link for the purpose of message transmission (see Form 13, Algorithm 4B).

1. FORM 13 - ALGORITHM SELECTION

Form	Algorithm														
	1A	1B	2A	2B	2C	2D	2E	3A	3B	3C	4A	4B	5A	5B	6A
E.G. 13	0	0	1	1	0	0	1	1	0	1	0	0	1	1	1

Algorithm 1 — Transmission Path Selection:
- A = 0 If all suitable links are in use, choose the first one and wait.
- A = 1 If all suitable links are in use, wait until one becomes available.
- B = 0 Choose the first suitable link which is not in use; if all are in use, see Algorithm 1A.
- B = 1 Choose the first suitable link whether or not it is in use.

Algorithm 2 — Memory Allocation:
- A = 0 Element (i.e., routine and data block) confiscation is not permitted.
- A = 1 If critical tasks are being considered (See Algorithm 3B), they may confiscate elements or space.
- B = 0 Consolidate space whenever an element is no longer needed.
- B = 1 Consolidate space only when required for loading additional elements.
- C = 0 Elements may coreside in pages.
- C = 1 Each element must start on a new page.
- D = 0 Inhibit space consolidation.
- D = 1 Permit space consolidation.
- E = 0 Consolidate space only to meet a requirement.
- E = 1 Consolidate space in total for a virtual machine whenever a requirement cannot be met for element loading.

Algorithm 3 — Task Scheduling:
- A = 0 Processing is not interruptible.
- A = 1 Processing is interruptible by the executive and critical tasks.
- B = 0 Task criticality is not considered; i.e., all tasks are treated as noncritical
- B = 1 Critical tasks have precedence and confiscation privileges over noncritical tasks in obtaining processors if interruptions are permitted (See Algorithm 3A).
- C = 0 Scheduling is on a cyclic basis; i.e., tasks are placed in time-ordered queues for execution.
- C = 1 Scheduling is by task priority.

Algorithm 4 — Unit Selection:
- A = 0 No special treatment for critical tasks.
- A = 1 If critical tasks are being considered (See Algorithm 3B), they may confiscate nonsharable devices and storage units.
- B = 0 Choose a virtual machine for a task without regard to explicit data link connections; i.e., implicit links are to be assumed.
- B = 1 Select a virtual machine for each task which permits all messages associated with the task to be transmitted over explicit data links; i.e., implicit links are not allowed.

Algorithm 5 — Element Loading:
- A = 0 Do not use a processor to perform loading service.
- A = 1 Use a processor for loading elements.
- B = 0 Place elements in memory without transmitting loading messages.
- B = 1 Load elements by transmitting from library data sets to memory.

Algorithm 6 — I/O Service:
- A = 0 Do not use a processor for I/O initiation or I/O interrupt response.
- A = 1 Use a processor to initiate I/O and to respond to I/O interrupts.

m. FORM 14 - VIRTUAL MACHINE DEFINITION

Form	Virtual Machine	Executive Memory Unit	Virtual Memory		
			Size	Page Size	
14	n	nn	nnnnnnnnn	nnnnnnnnn	
E.G. 14 14	 1 2	 1 11	 100000 120000	 1000 500	

Virtual Machine — A number between 1 and 6, indicating the virtual machine being defined.

Executive Memory Unit — The number of the memory unit (see Form 7) in which the simulated executive for the virtual machine (i.e., routine 30001 and data block 40001) will reside. It must be a memory which is connected to a class 10 processor (ee Form 9) for the machine, since that is required for execution of the executive.

Virtual Memory — Size is the total number of addressable characters in the composite of memory units for the virtual machine. Page Size is the number of characters per addressable page of memory.

5.1.3.5 Preparation of a Job Schedule. The Job Schedule provides the means to initiate jobs, add job and task definitions, modify or add system specifications, and specify events through setting of Savex Cells.

The formats for scheduling must conform to the same rules that apply to specification forms. Each initiation is represented by a line of input, of which only the first 70 positions are relevant.

A double prime ('') in positions 1 and 2 or a quotation mark (") in position 1 indicating that the line is a comment, as specified in paragraph 5.1.3.4 - Preparation of Model Specifications, can also be used for the job schedule. All input lines are interpreted on a free-field basis, i.e., one or more spaces separate successive fields.

The Job Schedule is read during simulation and forms should be ordered on the time field (i.e., the first field). No job or event should be scheduled to start before simulated time 20 since a line which begins with a number less than 20 is treated as a specification form The executive is automatically started and should not have a job initiation in the schedule.

a. JOB INITIATION

Time	Job	Trigger Message	Repeat Flag
nnnnn	nn	nn	n
E.G.			
150	2		
160	3	28	0
210	6	12	1

Time — The time (in milliseconds) at which the job is to introduced to the system.

Job — The number of the job (see Form 1) to be initiated.

Trigger Message — If this field is specified, it must contain the number of a message (see Form 5) which must complete transmission after the given time, in order to start the job. If unspecified, the job will be started immediately.

Repeat Flag — Applicable only if a trigger message is specified:

0 - the job is initiated once, following the next completion of the transmission of the specified message.

1 - the job is to be initiated following every occurrence of the specified message transmission.

b. EVENT OCCURENCE

Time	0	Events		- - - - -	Event K	
		Savex	Increment		Savex	Increment
nnnnn	0	nnnn	nnn		nnnn	nnn
E.G.						
1800	0	688	+2			
1950	0	680	1		681	10
1960	0	688	-1		681	1

Time — The time (in milliseconds) at which the indicated events occur. It must be greater than 19.

Savex — The number of the Savex cell associated with the event.

Increment — The amount by which the Savex cell is to be changed.

5.1.4 Overall Approach

In coordination with NASA a simulation model version was developed for the Space Shuttle, reflecting the hardware characteristics and the functions to be performed during the Approach and Landing Test (ALT) of the Space Shuttle Orbiter.

Hardware parameters were extracted from NASA Computer Program Development Specifications, from IBM Functional and Technical Descriptions, and from Rockwell International Functional Subsystem Requirements documentation. These parameters are discussed in detail in paragraph 5.2.3.

Characteristics relating to the expected performance of software programs, modules, and cyclic executives have been based largely on the ALT Functional Design Specifications by IBM that describe the functions performed during the various major modes of the ALT configuration, the cyclic executive processors and the Specialist functions. Refined timing of the execution phase of each routine was derived by determining the execution time for each set of instructions that operate under certain specified conditions, based on the instruction execution times given in References 26 through 28 and execution times given in Appendix D of Volume 2, Part I (Table D-2), of Reference 19 and Appendix D (Table D-2) of Volume 2, Part 3, of Reference 19.

5.1.4.1 Approach to Hardware Definition. The model consists of the entities listed below.

Certain entities are simulated separately as their characteristics and functions are distinct and logically different even though they are physically constructed as a unit, e.g., the GPCs are logically depicted as consisting of a CPU, a Core Memory, and an IOP.

The number in parentheses indicates the IMSIM specification number as explained in paragraph 5.1.3 and corresponds to the number on the diagram in Figure 2-1.

a. Four Space Shuttle Advanced System/4Pi Model AP-101 Central Processing Units (90001, 90002, 90003, 90004).

b. Four GPC/IOP combined Main Memories, containing 65.5K words each (262K bytes each) (70001, 70002, 70003, 70004).

c. Four Input/Output Processors (IOP) with 24 channels each.

d. Mass Memory consisting of a tape controller and two Mass Memory tapes, each tape with a capacity of 134 X 10^6 bits (17,000,000 characters) (80001, 80002).

e. Four Display Electronic Units (DEU) (60001, 60002, 60003, 60004).

f. Four Display Units (DU) (60005, 60006, 60007, 60008).

g. Three Keyboard Entry Units (KB) (60027, 60028, 60029).

h. Eight Multiplexer/Demultiplexer units (MDM) for flight critical functions (60009, 60010, 60011, 60012, 60013, 60014, 60015, 60016).

i. Three Display Driver Units (DDU) (60017, 60018, 60019).

j. Two Pulse Code Modulator Master Units (PCMMU) (60095, 60096).

k. Seven Multiplexer/Demultiplexers (MDM) for forward and aft operational instrumentation (60020, 60021, 60022, 60023, 60024, 60025, 20026).

l. Twenty-seven data link buses grouped by function 100001 through 100027).

m. Eleven half-duplex data links for interdevice communications (100028 through 100038).

Each of the above items is described in detail in paragraph 5.2.3.2.

A diagram of the simulated configuration for ALT is given in Figure 2-1 contained in Section 2.1 of the Summary, and depicts the hook-up of these elements.

5.1.4.2 Approach to Workload Definition. The software requirements for the Space Shuttle Orbiter onboard digital data processing system specify a hierarchical system to be constructed according to established techniques of structured programming. The activity within an individual computer of the DDPS essentially consists of a set of tasks wich may be performed concurrently (i.e., multitasking) and which compete with each other for use of the central processor. The tasks are assigned unique priorities to be used in resolving conflicts over the CPU, and they are scheduled either by time pulses or by the occurrence of specific events. All input/output control is confined to certain "executive" tasks and is handled by input/output processors (IOP), thereby relieving the CPU of these specialized functions.

Definition of an IMSIM workload to represent this activity necessitated:

a. establishment of specific objectives for simulation,

b. an understanding of the organization and intercommunication of the software,

c. information and assumptions concerning the amount of computing and data transmission performed as a function of the state of the system,

d. value judgments as to relative significance of functions, events, states, etc., to the simulation objectives, and

e. methods to be used for representation of each of the significant aspects of the system.

These five areas of concern were interdependent and had to be treated in parallel; for example, it is impractical to gather detailed information and make assumptions about a software module which is essentially irrelevent to simulation goals. Simulation objectives were tentatively established and are presented in Sections 5.1.1 and 5.1.2. The methods for software representation

are described in Section 5.2.3.3. Since virtually all of the activity within the DDPS is organized into schedulable "processes", these processes are identified, together with the conditions for activating them, and the program modules which are executed for them. The processes are associated with four areas: User Interface, System Control, Guidance Navigation and Control, and Systems Management.

5.1.4.2.1 User Interface Processes. Six User Interfaces processes were considered for representation. They are identified by the principal modules as follows:

a. DCI_CYC_DISPLAY - Cyclic Display Processing
Scheduled for execution at 100 ms intervals.

Other modules called include:
DCI#FMT - Data Formatting
DCI#CON - Data Conversion

b. DCS_SYNC - GPC/PCMMU Data Cycle Synchronizer
Scheduled by DDC when a GPC is initialized or on user request for synchronization of data cycles. It enables DCD for call by AIE.

c. DDC_DWN_LST_CONTROLS - Downlist Data Controls Processor
Scheduled to execute on an undetermined time interval.

d. DGI_LDB_IO - Launch Data Bus I/O Processor
Scheduled to execute on an undetermined time interval.

Other modules called include:
DLM_LDB_ROUT - LDB Message Router
DMM_MCDS_PROCESS - MCDS Message Processor

e. DMC_SUPER - User Interface Control Supervisor
Performed whenever events indicate MDCS or ICC messages, or an applications service request, or completion of MM I/O service.

Other modules called include:
DMC_FUNCTIONS - Keyboard Functions
DMC_SEQ_REQ_PROC - Sequence Request Processing
DMC_APP_INT - Application Control Interface
DMC_MCDS_CNT - MCDS Display Control
DMC_NEW_DISPLAY - New Display Processing
DMC_APP_KEY_PROCESS - Application Keys Processing
DIM_ICC_COLLECTOR - ICC Message Collector

f. DMI_MCDS_IN - MCDS Input Processor
Scheduled to execute at 200 ms intervals.

Other modules called include:
DMM_MCDS_PROCESS - MCDS Message Processor

5.1.4.2.2 System Control Processes. Eleven System Control processes were considered for representation. They are identified by their principal modules as follows:

a. AIE_SIP - System Software Interface Processor
Scheduled to execute at 40 ms intervals on all GPCs for synchronization and ICC.

Other modules called include:
DCD_DOWNLIST - GPC Downlist Formatter
DIM_ICC_COLLECTOR - ICC Message Collector
DME_ICC_ROUT - ICC Message Router
DLA_LIGHT_ALARM_PROC - Lights and Alarm Processing

b. AIG_DEU_LOADER - DEU Loader
Scheduled for execution only during IPL or SM8 to load a DEU.

c. ARA_GPC_SWITCH - GPC Switch Monitor
Scheduled to execute at 1000 ms intervals to monitor switches and adjust system state.

Other modules called include:
DMS_MSG_LSF - Message Line Support Function
DIM_ICC_COLLECTOR - ICC Message Collector

d. ASA_IDLE_SPEC - Idle Specialist Function (SPEC 0-00)

e. ASB_RD_/WRT - Read/Write Specialist Function

f. ASC_TIME_MGMT - Time Management Specialist Function

g. ASD_DATA_CONTROL - Data Control Specialist Function
Not invoked during Mated/Drop Test

h. AIB_GPC_LOCATOR - GPC Locator

i. ARB_IDLE_OPS - Idle Operational Sequence

j. ARC_GPC_RECONFIG - GPC Reconfiguration

k. ARH_SEC_GPC_RECONFIG - Secondary GPC Reconfiguration
Not scheduled during Mated/Drop Test

5.1.4.2.3 Guidance, Navigation, and Control Processes. Twenty-two GN&C processes were considered for representation. They are identified by their principal modules as follows:

a. GAA_OPS2_MATED_DROP_TEST - Mated/Drop OPS Control Segment
Scheduled via UI to process requests related to GNC OPS 2.

Other modules called include:
ARF_DPS_CONFIG_ITEM - DPS Configuration Item Processor
GKR_RM_CONT_KYBD_PROC - RM-Control Keyboard Processor

b. GAD_MATE_IDLE - Mated/Drop Test Idle Mode
Scheduled to execute at 40 ms intervals while Mode 200 prevails.

Other modules called include:
GBM_IMU_BYTE - IMU Byte Processing
GMC_ACP_ACUM - IMU Accelerometer Accumulation
GMD_RES_PROC - IMU Resolver Processor
GME_FLT_ATT- IMU Flight Attitude Processor
GMF_GYO_TORQ - IMU Gyro Torquing
GRC_NAVAID_SF - FDI NAVAID Selection Filter

c. GAV_OPS1_PRE_FLT - Preflight OPS Control Segment
Scheduled via UI to process requests related to GNC OPS 1.
Not invoked during Mated/Drop Test.

d. GEF_FC_EXEC - Fast Cycle Executive
Scheduled to execute at 40 ms intervals for Preflight and Mated/Drop Test Flight Control except during idle modes.

Other modules called include:
GCA_PTCH_CE - FCS Pitch Control
GCB_RY_CE - FCS Roll/Yaw Control
GCC_BF_CE - FCS Body Flap Control
GCD_ELVTR_AUTO_CE - FCS Elevator Auto Control
GCE_ELVTR_MD_CE - FCS Elevator Man/Dir Control
GCF_ELVTR_CAS_CE - FCS Elevator CAS Control
GCG_ALRN_AUTO_CE - FCS Aileron Auto Control
GCH_ALRN_MD_CE - FCS Aileron Man/Dir Control
GCI_ALRN_CAS_CE - FCS Aileron CAS Control
GCJ_RDR_AUTO_CE - FCS Rudder Auto Control
GCK_RDR_MD_CE - FCS Rudder Man/Dir Control
GCL_RDR_CAS_CE - FCS Rudder CAS Control
GCM_NW_CE - FCS Nosewheel Control
GCQ_SYS_CHKOUT - FCS Checkout (from GCR)
GCR_RECON_INIT - FCS Reconfiguration and Initialization
GCS_SCHED_GAINS - FCS Schedule Gains - Control Laws
GPN_DP_1 - FCS Data Processing 1
GPO_DP_2 - FCS Data Processing 2
GPP_CMDS_PROC - FCS Commands Processor

e. GEN_MATE_DROP_EXEC - Mated/Drop Executive
Scheduled to execute at 80 ms intervals during active modes of OPS 2.

Other modules called include:
GDA_DED_DISP_PROC - Dedicated Display Processor
GDB_AVVI_AMI_PROC - Dedicated Display AVVI, AMI Processor
GDE_ADI_PROC - Dedicated Display ADI Processor
GDF_HSI_PROC - Dedicated Display HSI Processor

GDZ_DISP_PROC - CRT Display Processor
GGA_TAEM_GUID - TAEM Guidance
GGB_AL_GUID - Approach/Landing Guidance
GGC_P_TRAJ - Guidance Pitch Trajectory (from GGB)
GGD_TRAJ_CAP - Guidance Trajectory Capture (from GGB)
GGE_SGS - Guidance Steep Glideslope (from GGB)
GGG_FF - Guidance Final Flare (from GGB)
GGH_P_SYNC - Guidance Pitch Synchronization (from GGB)
GGI_R_CMD - Guidance Roll Command (from GGB)
GGJ_AVG_G_SP - Guidance Single Precision Average G
GGK_USER_PARAM - Guidance User Parameters
GMB_IMU_BITE - IMU Bite Processing
GMC_ACP_ACUM - IMU Accelerometer Accumulator
GMF_GYO_TORQ - IMU Gyro Torquing
GMH_ACP_COMP - IMU Accelerometer Pulse Compensation
GMK_GYO_COMP - IMU Gyro Compensation
GML_ACP_TRSF - IMU Accelerometer Pulse Transform
GMN_IMU_MODING - IMU Moding
GNA_MLS_MEAS - Navigation MSBLS Measurement Processing
GNB_TACAN_MEAS - Navigation TACAN Measurement Processing
GNC_BARO_ALT - Navigation Baro-Altimeter Measurement Processing
GND_RADAR_ALT - Navigation Radar-Altimeter Measurement Processing
GNE_NAV_EXEC - Navigation Executive
GN1_DATA_SNAP - Navigation Data Saving
GN3_MEAS_SCHDLR - Navigation Measurement Scheduler
GN7_NAV_FILTER - Navigation Filter
GPA_ADTA_DATA_PROC - ADTA Data Processor
GPC_AD_CALC - Air-Data Calculations
GPM_MSBLS_DATA_PROC - MSBLS Data Processor
GPR_RA_DATA_PROC - Radar Altimeter Data Processor
GPT_TACAN_DATA_PROC - TACAN Data Processor
GRC_NAVAID_SF - FDI NAVAID Selection Filter
GRE_FIDR - FDI Sequencer
GRF_TRANS_FIDR - Transducer Sequencer (from GRE)
GRG_ACT_FDBK_FIDR - Actuator Feedback Sequencer (from GRE)
GRH_SWT_FIDR - Switch Sequencer (from GRE)
GRI_RGA_FIDR - Rate-Gyro Sequencer (from GRE)
GRJ_AA_FIDR - Accelerometer Assembly (from GRE)
GRK_RA_FIDR - Radar Altimeter (from GRE)
GRL_IMU_FIDR - IMU Sequencer (from GRE)
GRM_ADTA_FIDR - ADTA Sequencer (from GRE)
GRN_TACAN_FIDR - TACAN Sequencer (from GRE)
GRO_MSBLS_FIDR - MSBLS Sequencer (from GRE)
GRP_BF_FIDR - Body Flap Sequencer (from GRE)

f. GEN_TAEM_NAV_CYC - TAEM Navigation Cyclic Executive
Scheduled to execute at 2000 ms intervals following platform release request.

Other modules called include the Navigation Executive (GNE) and the navigation modules called for GEM, plus

GN2_INFLT_HARDSTAND - Navigation Inflight/Hardstand Update
GN4_COV_RECONFG - Navigation State and Covariance Reconfiguration
GN5_AVG_G_DP - Navigation Double Precision Average G
GN6_COV_PROP - Navigation Covariance Matrix Propagation

g. GEP_PRE_FLT_EXEC - Preflight Executive
Scheduled to execute at 80 ms intervals during the preparation mode (101) of OPS 1.

Other modules called include:
GDA_DED_DISP_PROC - Dedicated Display Processor
GDZ_DISP_PROC - CRT Display Processor
GMN_IMU_MODING - IMU Moding
GPA_ADTA_DATA_PROC - ADTA Data Processor
GPM_MSBLS_DATA_PROC - MSBLS Data Processor
GPR_RA_DATA_PROC - Radar Altimeter Data Processor
GPT_TACAN_DATA_PROC - TACAN Data Processor
GRE_FIDR - FDI Sequencer
plus FDI sequencer modules as for GEM

h. GET_NAV_TRANS - Navigation Rate/Mode Transition Task
Scheduled for execution when the Navigation Transition event occurs.

i. GMA_MIN_EXEC - Minor Cycle Executive
Scheduled to execute at 40 ms intervals during the preparation mode of OPS 1 and during the Mated/Drop Test unless the idle mode is entered while the platform is not released.

Other modules called include:
GMB_IMU_BITE - IMU Bite Processing
GMC_ACP_ACUM - IMU Accelerometer Accumulator
GMD_RES_PROC - IMU Resolver Processor
GMF_GYO_TORQ - IMU Gyro Torquing

j. GMG_MAJ_EXEC - IMU Major Cycle Executive
Scheduled to execute at 320 ms intervals when specified IMU functions are to be performed.

Other modules called include:
GMH_ACP_COMP - IMU Accelerometer Compensation
GMI_T_UPDATE - IMU Transform Update
GMJ_TOR_TRSF - IMU Torquing Transform
GMK_GYO_COMP - IMU Gyro Compensation
GML_ACP_TRSF - IMU Accelerometer Pulse Transform
GMM_LAT_FUNC - IMU Large Angle Torquing
GMQ_LSF_FILR - IMU Least Squares Filter

k. GMS_IMU_ATT - IMU Attitude Determination
Scheduled by SPEC GUC to control tilt estimation via GMG. It waits for the function to complete.

Other modules called include:
GMP_TNB_CL - IMU Nav Base-to-Cluster Transform

l. GMT_PFLT_CALA - IMU Preflight Calibration A
GMU_HANG_CALA - IMU Hangar Calibration A
GMV_HANG_CALB - IMU Hangar Calibration B
Any of which is scheduled by SPEC GUC to control cluster positioning via GMG. It waits for the function to complete.

m. GMX_GC_ALIGN - IMU Gyrocompass Alignment
Scheduled by SPEC GUC to control gyrocompass alignment via GMG. It waits for the function to complete.

n. GMY_VEL_TILT - IMU Velocity and Tilt
Scheduled by SPEC GUC for execution upon completion of GMX.

o. GTX_DD_CKOUT - DD Dedicated Display Checkout
Scheduled to execute at 1000 ms intervals by SPEC GUC.

p. GUA_HORIZ_SIT - Horizontal Situation Control Segment
Scheduled by UI upon request for horizontal situation display.

q. GUB_VERT_SIT - Vertical Situation Control Segment
Scheduled by UI upon request for vertical situation display.

r. GUC_IMU_OPRTNS - IMU Operations Control Segment
Scheduled by UI upon request for IMU functions.

s. GUG_FCS_DD_CKOUT - FSC/Dedicated Display Checkout Control Segment
Scheduled by UI upon request for FCS/Dedicated display checkout.

t. GUH_RM_NAV - RM-NAV Control Segment
Scheduled by UI upon request for RM-NAV functions.

u. GUI_RM_CONT - RM-CONT Control Segment
Scheduled by UI upon request for RM-CONT functions.

Other modules called include:
GKR_RM_CONT_KYBD_PRO - RM-Control Keyboard Processor

v. GUK_NAV_TRGT_UPDT - NAV/TARGET Update Control Segment
Scheduled by UI upon request for NAV/TARGET update.

5.1.4.2.4 Systems Management Processes. Eleven SM processes were considered for representation. They are as follows:

a. SDA_DATA_ACQUISITION - Data Acquisition
Scheduled to execute at 50 ms intervals.

b. SDM_PERFORM_MON_CONTROL - Performance Monitoring Control
Scheduled to execute at 500 ms intervals.

Other modules called include:
SFD_FAULT_DETECT_ANNUN - Fault Detection & Annunciation
SPP_PRECON_PROCESS - Precondition Processing
SSC_SPECIAL_COMP - Special Computations
SAS_ANALOG_SCALE - Analog Scaling

c...g. Five Specialist functions which are not invoked during Mated/Drop Test.

h. Pretakeoff SCM Specialist Function

i. Predrop SCM Specialist Function
Scheduled by UI upon request for subsystem configuration monitoring.

Includes the module:
SPM_SUBSYS_CONFIG_MON - Subsystem Configuration Monitoring

j. SPO_PREFLIGHT_OPS - SM Preflight Operational Sequence
Scheduled via UI to process requests related to SM OPS1, not invoked during Mated/Drop Test.

k. SFO_FLIGHT_OPS - SM Flight Operational Sequence
Scheduled via UI to process requests related to SM OPS 2.

Other modules called include:
SSC_SPECIAL_COMP - Special Computations
SPP_PRECON_PROCESS - Precondition Processing
SAS_ANALOG_SCALE - Analog Scaling
SFD_FAULT_DETEC_ANNUN - Fault Detection & Annunciation
SPM_SUBSYS_CONFIG_MON - Subsystem Configuration Monitoring

5.1.4.2.5 Representation of Processes for Simulation. The DDPS processes listed in the preceding sections have the following common operational characteristics: Each is activated by external stimuli (specific events and/or clock pulses) by assigning a CPU to the process on a priority basis; each is subject to interruption for transfer of its assigned processor to a process of higher priority; each process involves the execution of one or more modules of code which are resident in main memory; and, computation associated with performing a process is a function of the state of the system at the time the process is invoked. These characteristics can all be satisfactorily incorporated in the DDPS model if the processes are represented as IMSIM "tasks".

Each task is assigned to a "service class" and given a working "priority" within the class to create a precedence series which correlates with that of the actual DDPS process priorities. Processes which recur at regular time intervals are designated as "cyclic" tasks. The modules which are executed in performing a process are defined as "routines" and may be included or shared among several tasks by declaring them to be elements of specific tasks. DDPS data transmissions are defined as IMSIM "messages"; these are also declared to be elements of appropriate tasks.

IMSIM has been augmented with logic for the representation of significant DDPS events and the maintenance of a system state vector. These are employed in the definition of "GO-NoGo" functions and "Computation Time" functions. The former are used to control the activation of tasks and the latter are evaluated when a task is activated to determine the amount of computing to be simulated for the represented process. The Computation Time functions are actually associated with routines rather than tasks, and therefore, when a task is activated, the functions for all routines which are elements of the task are evaluated and the results summed.

A detailed description of the represented events and state vector is presented in Section 5.2.4.

5.1.4.3 Approach to Simulated Time-Line Segments (JOBSCHEDULES). The first set of time-line segments, hereafter called"jobschedules", was developed for the purpose of exercising the model and taking the model through all phases of flight to exercise all software functions. The set started at simulated time 0 with preflight conditions and continued through Mated Flight, Separation, TAEM, Approach & Landing, and Rollout. The purpose was to determine if any significant problems developed during any of the phases.

A second set of jobschedules was developed based on the fact that the heaviest workload occurs at 16-second intervals, when all cyclic processors, executives, and programs are competing for the CPU. This will occur when the tasks that are cyclic at 40 ms, 50 ms, 80 ms, 100 ms, 200 ms, 320 ms, 500 ms, 1000 ms, and 2000 ms all culminate at 16-second intervals. The purpose was to determine if any significant problems developed during a concentration of functions at a given time.

A third set of jobschedules was developed based on different flight segments during ALT, such as Mated Flight and Separation, Postseparation and TAEM, TAEM and Approach & Landing, and Rollout. The purpose here was to determine if any significant problems developed during flight segments.

A fourth set of jobschedules with four jobs was developed based on the simulation of four different Virtual Machines. The purpose was to determine that operation with four active GPCs did not result in problems not discovered in the previous set of runs.

Events based on manual actions (Specialist Functions) were incorporated in each of these jobschedules and are detailed in paragraph 5.2.5.

All these jobschedules with the simulated Specialist Functions are discussed in detail in Section 5.2.5.

5.2 TASKS PERFORMED

This section discusses the activities performed under each of the six tasks specified in the Statement of Work.

5.2.1 Data System Requirements Definition (S.O.W. 2.1.1)

All documentation received from NASA was analyzed, and a thorough understanding of the functional requirements for the Space Shuttle Orbiter's hardware and software was gained.

In close coordination with NASA a baseline for the simulation model was established, viz., the Approach and Landing Test (ALT) configuration, with Memory Configuration #2 and Downlist format #1 as established in the Computer Program Development Specification, Volume I. The two Major Functions in this configuration were determined to be Guidance, Navigation & Control (GN&C), and System Management (SM). The Operational Sequences for the model were determined to be GN&C Mated/Drop Test Ops and SM Flight Ops.

The requirements that were defined for the functions to be performed in the model constituted a realistic approach for the IMSIM simulation model.

These requirements were subsequently transformed into a form suitable for IMSIM and resulted in the simulation model version described in paragraphs 5.2.3 and 5.2.4 that accurately reflected the defined requirements for the Orbiter in the ALT configuration.

Details of the Hardware and Software configurations is given in paragraph 5.2.3.

5.2.2 Sensitivity Analysis (S.O.W. 2.1.2)

Following the Data System Requirements Definition Task, and prior to establishing a specific simulation configuration and its operational modes, a sensitivity analysis of the proposed Space Shuttle Orbiter Data Processing Subsystem was conducted. The primary sources of information and data used to conduct the sensitivity analysis were References 6, 7, 12, and 14. From a detailed review of the referenced documents five potential data processing bottleneck problem areas were defined. The potential problem areas were identified as:

a. CPU Utilization

b. IOP lockout of the CPU

c. The GPC/PCMMU interface

d. CPU synchronization

e. Multifunction Display processing

The process by which the five potential problem areas were identified was based on a detailed review of the technical tasks to be performed by the DDPS, the characteristics of the hardware and software to be used in performing these technical tasks, and the operational environment (flight phases, operational modes, etc.) within which the tasks would be required.

The final configuration and operational mode of the IMSIM/modeled Orbiter Digital Data Processing Subsystem provided data for only one of the five potential problem areas identified (CPU utilization). However, each potential problem area is discussed in this section to indicate why it was initially identified.

5.2.2.1 CPU Utilization. From a detailed review of the Orbiter DDPS tasks to be performed for various operational modes and the requirement that the CPU be capable of handeling cyclic tasks plus randomly generated special tasks, the question of the CPU's capability to perform all required tasks within an allocated time period was identified as a potential problem area. Following the selection of the ALT configuration with the two major functions of "Guidance, Navigation, and Control" plus "Systems Management" for the IMSIM model, this problem area was selected as the principal problem area to be investigated.

Based upon this decision the IMSIM model described in this report was adapted to investigate the potential CPU utilization problem.

5.2.2.2 IOP Lockout of the CPU. Functional and operating requirements for the IOP define two basic operational modes for IOP-initiated requests for access to main memory. The first is when seven or less requests are stacked in the direct memory access (DMA) queue. For this condition, the IOP accesses main memory during CPU instruction execution by cycle-stealing action. The average time for IOP access to main memory for a single request, for this condition, is 2.5 microseconds.

When there are more than seven IOP requests stacked in the DMA queue, IOP DMA enters a "BURST MODE" of operation. During Burst Mode operation, CPU program execution is stopped and the IOP has exclusive access to main memory. The average main memory access time for each IOP request is 1.4 microsecond for Burst Mode operation. A maximum of 64 consecutive main memory accesses by the IOP are allowed in the Burst Mode. The sixty-fifth consecutive IOP main memory request generates an IOP error condition and an interrupt is sent to the CPU and the Burst Mode is disabled.

There are three types of IOP requests for main memory, these are (1) a request for the next MSC or BCE macroinstruction for program execution, (2) a request for data to be transmitted to Shuttle subsystems, and (3) a request to place data received from Shuttle subsystems into main memory.

The question raised by the above description of the IOP "Burst Mode" is the possibility of limiting CPU access to main memory to a time insufficient to accomplish required processing. This condition could possibly exist if there were repeated sequences of IOP Burst Mode operations.

The IMSIM model established to investigate ALT CPU Utilization was incapable of addressing the potential problem of IOP lockout of the CPU for two reasons. First the ALT configuration does not include major portions of the shuttle orbiter's subsystems. It is the IOP requests to and from main memory for these subsystems that could possibly create the problem. Second, the discrete time unit element of the IMSIM simulation model was one milliscond.

To adequately study the potential IOP lockout problem the simulation would require a time unit resolution of one microsecond.

5.2.2.3 The GPC/PCMMU Interface. The pulse code modulation master unit (PCMMU) is an intermediate data transfer unit between the GPCs and seven operational instrument data subsystems and between the GPCs and the payload data subsystem. Within the total Shuttle Orbiter DDPS, the CPU and the PCMMU are the only devices that can enable multiplexer interface adapter units for the transmission or reception of serial bus data.

Functionally the PCMMU performs the following:

a. Through internal control, it requests input data from the operational instrumentation and payload data subystems. These data are stored in appropriate PCMMU random access memories.

b. The PCMMU stores data commanded to it from each GPC into toggle buffers and allows any GPC to access all operational instrumentation and payload data.

c. The PCMMU outputs formatted (downlisted) data to a network signal processor which is used to control downlink data.

Operational functions conducted between GPCs and a PCMMU are performed asynchronously within a data cycle which is synchronized between the two units. Because there will be different operational functional requirements between the GPCs and the PCMMU for different operational modes, a potential data processing problem could exist for excessive GPC/PCMMU asynchronous operation and/or for malfunctions of the GPC/PCMMU Data cycle synchronization.

Because the ALT Mated/Drop test does not incorporate the GPC/PCMMU Data Cycle Synchronizer Software, this potential problem area was not investigated.

5.2.2.4 CPU Synchronization. The five GPCs in the Space Shuttle Orbiter are interconnected by serial data buses and can be operated as independent or redundant units. A basic operational design philosophy of the Shuttle Orbiter DDPS is to provide a capability whereby the computations of any one CPU may be verified by other CPUs whenever these CPUs constitute a redundant set. The objective of this capability is to ensure fail-operational and fail-safe system performance during critical flight phases.

To achieve this operational capability, CPU synchronization of all GPCs which constitute a redundant set has been assumed. A potential data processing problem area could be created if CPU synchronization for redundant operations is not maintained.

From the functional design specifications of the DDPS it would appear that adequate hardware and software design considerations have been given to the CPU synchronization requirement. Each GPC contains three real-time clock timers and systems management synchronizing software programs have been functionally defined.

While the possibility of nonsynchronization of CPUs for redundant set operation may have been minimized by the system design, the consequences of its occurence warrant its consideration as a potential problem area to be studied by simulation. For this reason it was so identified in the sensitivity analysis.

Because the IMSIM Model configured to study CPU Utilization was constructed on the ground rule that only one active GPC need be simulated (because all other GPCs would have identical loading), the problem of CPU synchronization was not addressed. A specific model should be developed to assess this potential problem area. The present model is not appropriate, as it employs a 1 millisecond time unit.

5.2.2.5 Multifunction Display Processing. The multifunction CRT display system has been designed to provide the principal flight crew interface for data entry, subsystem monitoring, program selection, and the presenting of alphanumeric and graphic data displays. A variety of fixed-display formats and types of displays are defined by the software system to be used. It would appear that under normal operating conditions for the various flight tests and operational phases this interacting crew/system design is capable of meeting all requirements and does not constitute a data processing problem. However, for abnormal operating conditions a potential data processing problem could be generated if extensive crew/system interaction is required. Operationally, most displays are stored in mass memory and are updated by the GPCs. For a condition where the number and rate of crew requests for displays is very high, the possibility exists that the combination of GPC operational task processing and GPC display processing could create an Orbital Data Processing System problem.

For the ALT, the extent of crew/system interface is not extensive, and for the durations of the tests, the crew would not be generating a large number of display requests. For this reason, the potential problem of multifunction display processing was not addressed.

It was noted in some simulation runs, however, that manual actions, generated within a 25-millisecond time frame, will cause a disrupt in the calling of the servicing function.

5.2.3 Test Design (S.O.W. 2.1.3)

Based on the results of task 1 - Data System Requirements Definition and task 2 - Sensitivity Analsyes, a test design was developed incorporating the findings of the previous studies. The Test Design resulted in:

a. The model generation, described in detail in paragraph 5.2.3.1.

b. The model's adaptation and parameterization, described in detail in paragraph 5.2.4.

c. The job schedule inputs, described in detail in paragraph 5.2.5.

5.2.3.1 Model Generation. This section describes the inputs and required formats for building and parameterizing the IMSIM model. Nine "input specification form" categories (Forms 6 through 14), as described in paragraph 5.1.3, are used for defining the hardware configuration. These inputs are described and listed in Section 5.2.3.2 below.

Five input specification form categories (Forms 1 through 5) are employed in specifying software workload characteristics. These inputs are described and listed in Section 5.2.3.3.

The inputs on these 14 specification forms were assembled for execution in the NASA.SPECS10.DATA and the NASA.SPECS20.DATA files.

A printout of these files is contained in Appendix B.

5.2.3.2 Hardware Simulation. The simulated hardware is described in detail by:

a. Processors

b. Memories

c. Mass Memory Storages

d. Devices

e. Datalinks

The parameters for the hardware simulation were derived from values extracted from the following references:

a. Computer Program Development Specification, No. SS-P-0002-110A, Volume 1, Book 1 (Revised), Level A Hardware (Reference 6).

b. Computer Program Development Specification, No. SS-P-0002-130A, Volume 1, Book 3, Launch Data Bus Software Interface Requirements (Reference 8).

c. Computer Program Development Specification, No. SS-P-0002-410A-2, ALT Functional Level Requirements, Volume IV, Book 1 (Revised), Guidance, Navigation & Control (Reference 10).

d. Functional Subsystem Software Requirements System Interface, Volume 6, Parts 1 and 2, Sections 1 through 11, and Appendices A through K, Orbiter 101 (References 12 and 13).

e. Space Shuttle Advanced System/4 Pi - Model AP-101, Central Processor Unit, Technical Description (Reference 15).

5.2.3.2.1 Processors. Four processors were simulated, one for each of the four GPC complexes.

Each of the GPC processors for the IBM 4pi/AP101 computer has a command execution time of 1.4 microseconds (processing speed of 714300 instructions per second) and is designated as belonging to Virtual Machine #1. The 4pi/AP101 central pr ssor can respond to the following interrupts:

I/O

Bounds Fault

Service request

There is no task switch time involved.

Two approaches were used. One approach was to simulate the four GPCs as all belonging to one Virtual Machine. One processor was represented as actively servicing all tasks while the other three processors were operating passively in the redundant mode, assuming to process identical tasks with ICC messages interchanging between GPC memories for synchronization. These specifications are contained in a data set NASA.SPECS10.DATA. Format description is given in paragraph 5.1.3 and in the IMSIM User's Manual (Reference 2).

The scripted inputs for this approach for the processors on IMSIM specification form 9 were as follows:

```
''
''CENTRAL PROCESSING UNIT (CPU) NO. 1
''      SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
9    1  0.48    10        5         0       1       1  2  3  4
''
''CENTRAL PROCESSING UNIT (CPU) NO. 2
''      SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
''   2  0.48    10        5         0       1       2  1  3  4
''
''CENTRAL PROCESSING UNIT (CPU) NO. 3
''      SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
''   3  0.48    10        5         0       1       3  1  2  4
''
''CENTRAL PROCESSING UNIT (CPU) NO. 4
''      SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
''   4  0.48    10        5         0       1       4  1  2  3
''
''
```

The second approach used was to simulate each of the four processors as belonging to a different Virtual Machine (V.M.). This resulted effectively in each GPC representing a Virtual Machine. All computations were done fourfold and each VM acted independently, except for ICC. The actual output messages for three of the four VMs were suppressed except for the ICC messages, which were transmitted by all four VMs.

These specifications are contained in a data set NASA.SPECS20.DATA. The scripted inputs for this approach for the four processors on IMSIM specification Form 9 were as follows:

```
''CENTRAL PROCESSING UNIT (CPU) NO. 1
''      SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
9    1  0.48    10        5         0       1       1
''
''CENTRAL PROCESSING UNIT (CPU) NO. 2
''      SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
9    2  0.48    10        5         0       2       2
''
''CENTRAL PROCESSING UNIT (CPU) NO. 3
''      SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
9    3  0.48    10        5         0       3       3
''
''CENTRAL PROCESSING UNIT (CPU) NO. 4
''      SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
9    4  0.48    10        5         0       4       4
''
```

5.2.3.2.2 Memories. Four memories were simulated, one for each GPC. The main memory for each IBM/4pi AP-101 computer has a total capacity of 256K bytes. The main memory access rate was simulated at 750 ns (speedfactor of 1.4 bytes/microsec.). The page size in these memories was simulated at 2048 bytes with a total of 125 pages for each memory.

During the ALT Simulation, Memory Configuration #2 was in core permanently and no other Memory Configurations were required.

ALT Memory Configuration #2 was simulated with GN&C Ops #2 and SM Ops #2 as the Ops Overlays. This ALT Memory Configuration #2 was assumed loaded in all four GPCs.

As memory configurations will all be predetermined prior to flight, no problems were expected as to memory capacity and therefore, no division was simulated for the Major Function GN&C overlay and the Major Function System Management overlay, or the Ops overlays. The size of the routines are therefore also immaterial and a nominal value of 1 was used on the specification forms.

The scripted inputs for the core memories on Form 7 were as follows:

```
''MEMORY GPC 1
''          SPEED FACTOR          PAGES
7    1          1.4                125
''
''MEMORY GPC 2
''          SPEED FACTOR          PAGES
7    2          1.4                125
''
''MEMORY GPC 3
''          SPEED FACTOR          PAGES
7    3          1.4                125
''
''MEMORY GPC 4
''          SPEED FACTOR          PAGES
7    4          1.4                125
''
```

5.2.3.2.3 Mass Memory Storages. Two Mass Memory Storages were simulated. Both are identical in their characteristics and are simulated as two tape units, each tape with a 17,000,000 byte capacity (134 $X10^6$ bits). Access time to the unit was simulated as Variable 400 & Variable 399 with a minimum of 0.5 seconds and a maximum of 8 seconds for each tape unit. (See paragraph 5.2.4 for details on these random variables.) Transmission rate for each unit was set for 125 bytes/ms.

The scripted inputs for the mass memory storages on Form 8 were as follows:

```
''
''MASS MEMORY STORAGE (MM) NO. 1
''          A/D  SHARE  CYCLE  TRX RATE  CAPACITY   ACCESS PERIOD
8    1      1      1      0      125      17000000   399  500  0  0  0
''
''MASS MEMORY STORAGE (MM) NO. 2
''          A/D  SHARE  CYCLE  TRX RATE  CAPACITY   ACCESS PERIOD
8    2      1      1      0      125      17000000   399  500  0  0  0
''
''
```

5.2.3.2.4 Devices. The following devices were simulated:

a. Fifteen Multiplexer/Demultiplexers (MDMs) - 60009 through 60016 and 60020 through 60026 - which can be shared among tasks. Maximum record size each can hold was simulated at 1024 bytes.

Input and output rates were simulated at 120 bytes/ms. No reset time required.

The scripted inputs for these units on IMSIM specification Form 6 were as follows:

```
''
''MULTIPLEXER/DEMULTIPLEXER (MDM) FF1
''       A/D  SHARE     RECORD        TRANSMISSION RATE   RESET
''            CLASS      SIZE         INPUT      OUTPUT   PERIOD
6   9    1     1         1024          120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM) FF2
''       A/D  SHARE     RECORD        TRANSMISSION RATE   RESET
''            CLASS      SIZE         INPUT      OUTPUT   PERIOD
6   10   1     1         1024          120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FF3
''       A/D  SHARE     RECORD        TRANSMISSION RATE   RESET
''            CLASS      SIZE         INPUT      OUTPUT   PERIOD
6   11   1     1         1024          120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FF4
''       A/D  SHARE     RECORD        TRANSMISSION RATE   RESET
''            CLASS      SIZE         INPUT      OUTPUT   PERIOD
6   12   1     1         1024          120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FA1
''       A/D  SHARE     RECORD        TRANSMISSION RATE   RESET
''            CLASS      SIZE         INPUT      OUTPUT   PERIOD
6   13   1     1         1024          120          120     0
```

```
''
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FA2
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   14   1      1         1024              120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FA3
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   15   1      1         1024              120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FA4
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   16   1      1         1024              120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM) OF1
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   20   1      1         1024              120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM) OF2
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   21   1      1         1024              120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM) OF3
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   22   1      1         1024              120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM) OF4
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   23   1      1         1024              120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM) OA1
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   24   1      1         1024              120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM) OA2
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   25   1      1         1024              120          120     0
''
''MULTIPLEXER/DEMULTIPLEXER (MDM) OA3
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   26   1      1         1024              120          120     0
```

b. Four Display Electronic Units (DEUs) - 60001 through 60004 - which can be shared among tasks. Maximum record size each can hold was simulated at 8192 bytes.

Input rate was simulated at 120 bytes/ms and output rate at 62 bytes/ms. No reset time required.

The scripted inputs for these units on IMSIM specification Form 6 were as follows:

```
''DISPLAY ELECTRONIC UNIT NO. 1
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   1    1       1        8192             120          62      0
''
''DISPLAY ELECTRONIC UNIT NO. 2
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   2    1       1        8192             120          62      0
''
''DISPLAY ELECTRONIC UNIT NO. 3
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   3    1       1        8192             120          62      0
''
''DISPLAY ELECTRONIC UNIT NO. 4
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   4    1       1        8192             120          62      0
''
```

c. Four Display Units (DUs) - 60005 through 60008 - which can be shared among tasks. Maximum record size each can hold was simulated at 8192 bytes. Input rate was simulated at 38 bytes/ms. No reset time required.

The scripted inputs for these units on IMSIM specification Form 6 were as follows:

```
''
''DISPLAY UNIT NO. 1
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   5    1       1        8192             38           0       0
''
''DISPLAY UNIT NO. 2
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   6    1       1        8192             38           0       0
''
```

```
''
''DISPLAY UNIT NO. 3
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS       SIZE          INPUT       OUTPUT   PERIOD
6   7    1      1         8192            38             0     0
''
''DISPLAY UNIT NO. 4
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS       SIZE          INPUT       OUTPUT   PERIOD
6   8    1      1         8192            38             0     0
''
''
```

d. Three Display Driver Units (DDUs) - 60017 through 60019 - which can be shared among tasks. Maximum record size each can hold was simulated as unlimited and the Input and Output rates were simulated at 120 bytes/ms. No reset time required.

The scripted inputs for these units on IMSIM specification Form 6 were as follows:

```
''
''DISPLAY DRIVER UNIT (DDU) NO. 1
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS       SIZE          INPUT       OUTPUT   PERIOD
6   17   1      1            0            120          120     0
''
''DISPLAY DRIVER UNIT (DDU) NO. 2
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS       SIZE          INPUT       OUTPUT   PERIOD
6   18   1      1            0            120          120     0
''
''DISPLAY DRIVER UNIT (DDU) NO. 3
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS       SIZE          INPUT       OUTPUT   PERIOD
6   19   1      1            0            120          120     0
''
```

e. Three keyboard units (KBUs) - 60027 through 60029 - which can be shared among tasks. No specific record size was simulated. The output rate was simulated at 1 byte/ms with a 1 ms delay.

The scripted inputs for these units on IMSIM specification Form 6 were as follows:

```
''
''KEYBOARD UNIT (KBU) NO. 1
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   27   1     1            0               0            1      1
''
''KEYBOARD UNIT (KBU) NO. 2
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   28   1     1            0               0            1      1
''
''KEYBOARD UNIT (KBU) NO. 3
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   29   1     1            0               0            1      1
''
```

f. Two Pulse Code Modulation Master Units (PCMMUs) - 60095 and 60096 - which can be used by all tasks. The maximum record size for each unit was simulated at 2048 bytes and the Input and Output rates were simulated at 120 bytes/ms. No delay required.

The scripted inputs for these units on IMSIM Specification Form 6 were as follows:

```
''
''PULSE CODE MODULATION MASTER UNIT (PCMMU) NO. 1
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD
6   95   1     1          2048             120          120      0
''
''PULSE CODE MODULATION MASTER UNIT (PCMMU) NO. 2
''       A/D  SHARE      RECORD          TRANSMISSION RATE    RESET
''            CLASS      SIZE            INPUT       OUTPUT   PERIOD

6   96   1     1          2048             120          120      0
''
```

5.2.3.2.5 Datalinks. The following datalinks were simulated in the ALT Configuration depicted in Figure 2-1:

a. Five databuses for intercomputer communication - IC1 through IC5 - (100001 through 100005) with a maximum transmission rate of 1MHz.

The scripted inputs for these datalinks on IMSIM Specification Form 10 were as follows:

```
''
''INTERCOMPUTER COMMUNICATIONS DATALINK - IC1
''          MODE   TRANSMISSION RATE     TIME LAG
10   1       0        120                  0
''
''INTERCOMPUTER COMMUNICATIONS DATALINK - IC2
''          MODE   TRANSMISSION RATE     TIME LAG
10   2       0        120                  0
''
''INTERCOMPUTER COMMUNICATIONS DATALINK - IC3
''          MODE   TRANSMISSION RATE     TIME LAG
10   3       0        120                  0
''
''INTERCOMPUTER COMMUNICATIONS DATALINK - IC4
''          MODE   TRANSMISSION RATE     TIME LAG
10   4       0        120                  0
''
''INTERCOMPUTER COMMUNICATIONS DATALINK - IC5
''          MODE   TRANSMISSION RATE     TIME LAG
10   5       0        120                  0
''
```

b. Four databuses for Display System communication - DK1 through DK4 - (100006 through 100009) with a maximum transmission rate of 1 MHz.

The scripted inputs for these datalinks on IMSIM Specification Form 10 were as follows:

```
''
''DISPLAY SYSTEM DATALINK - DK1
''          MODE   TRANSMISSION RATE     TIME LAG
10   6       0        120                  0
''
''DISPLAY SYSTEM DATALINK - DK2
''          MODE   TRANSMISSION RATE     TIME LAG
10   7       0        120                  0
''
```

```
''
''DISPLAY SYSTEM DATALINK - DK3
''          MODE   TRANSMISSION RATE     TIME LAG
10   8       0        120                   0
''
''DISPLAY SYSTEM DATALINK - DK4
''          MODE   TRANSMISSION RATE     TIME LAG
10   9       0        120                   0
''
```

c. Eight databuses for Flight-Critical communication - FC1 through FC8 - (100010 through 100017) with a maximum transmission rate of 1 MHz.

The scripted inputs for these datalinks on IMSIM Specification Form 10 were as follows:

```
''
''FLIGHT CRITICAL BUS DATALINK - FC1
''          MODE   TRANSMISSION RATE     TIME LAG
10  10       0        120                   0
''
''FLIGHT CRITICAL BUS DATALINK - FC2
''          MODE   TRANSMISSION RATE     TIME LAG
10   11      0        120                   0
''
''FLIGHT CRITICAL BUS DATALINK - FC3
''          MODE   TRANSMISSION RATE     TIME LAG
10   12      0        120                   0
''
''FLIGHT CRITICAL BUS DATALINK - FC4
''          MODE   TRANSMISSION RATE     TIME LAG
10   13      0        120                   0
''
''FLIGHT CRITICAL BUS DATALINK - FC5
''          MODE   TRANSMISSION RATE     TIME LAG
10   14      0        120                   0
''
''FLIGHT CRITICAL BUS DATALINK - FC6
''          MODE   TRANSMISSION RATE     TIME LAG
10   15      0        120                   0
''
```

```
''
''FLIGHT CRITICAL BUS DATALINK - FC7
''          MODE   TRANSMISSION RATE     TIME LAG
10   16       0        120                  0
''
''FLIGHT CRITICAL BUS DATALINK - FC8
''          MODE   TRANSMISSION RATE     TIME LAG
10   17       0        120                  0
''
```

d. Two databuses for Mission Critical communication - PL1 through PL2 - (100020 through 100021) with a maximum transmission rate of 1 MHz.

The scripted inputs for these datalinks on IMSIM Specification Form 10 were as follows:

```
''
''MISSION CRITICAL DATALINK - PL1
''          MODE   TRANSMISSION RATE     TIME LAG
10   20       0        120                  0
''
''MISSION CRITICAL DATALINK - PL2
''          MODE   TRANSMISSION RATE     TIME LAG
10   21       0        120                  0
''
```

e. Two databuses for Mass Memory communication - MM1 through MM2 - (100018 through 100019) with a maximum transmission rate of 1 MHz.

The scripted inputs for these datalinks on IMSIM Specification Form 10 were as follows:

```
''
''MASS MEMORY DATALINK - MM1
''          MODE   TRANSMISSION RATE     TIME LAG
10   18       0        120                 500
''
''MASS MEMORY DATALINK - MM2
''          MODE   TRANSMISSION RATE     TIME LAG
10   19       0        120                 500
''
```

f. Two databuses for Ground Interface communication - LB1 through LB2 - (100022 through 100023) with a maximum transmission rate of 1 MHz.

The scripted inputs for these datalinks on IMSIM Specification Form 10 were as follows:

```
''
''GROUND INTERFACE DATALINK - LB1
''          MODE   TRANSMISSION RATE     TIME LAG
10   22       0         120                 0
''
''GROUND INTERFACE DATALINK - LB2
''          MODE   TRANSMISSION RATE     TIME LAG
10   23       0         120                 0
''
```

g. Four databuses for PCMMU communication - IP1 through IP4 - (100024 through 100027) with a maximum transmission rate of 1 MHz.

The scripted inputs for these datalinks on IMSIM Specification Form 10 were as follows:

```
''
''PCMMU DATALINK - IP1
''          MODE   TRANSMISSION RATE     TIME LAG
10   24       0         120                 0
''
''PCMMU DATALINK - IP2
''          MODE   TRANSMISSION RATE     TIME LAG
10   25       0         120                 0
''
''PCMMU DATALINK - IP3
''          MODE   TRANSMISSION RATE     TIME LAG
10   26       0         120                 0
''
''PCMMU DATALINK - IP4
''          MODE   TRANSMISSION RATE     TIME LAG
10   27       0         120                 0
''
```

h. Four datalinks for communication between Display Electronic Units and Display Units (100028 through 100031) with a maximum transmission rate of 800 bps. (bits/sec).

The scripted inputs for these datalinks on IMSIM Specification Form 10 were as follows:

```
''
''DU1/DEU1 DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   28       0           1                 0
''
''DU2/DEU2 DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   29       0           1                 0
''
''DU3/DEU3 DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   30       0           1                 0
''
''DU4/DEU4 DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   31       0           1                 0
''
```

i. Five datalinks for communication between Display Electronic Units and Keyboard Units (100032 through 100036) with a maximum transmission rate of 800 bps.

The scripted inputs for these datalinks on IMSIM Specification Form 10 were as follows:

```
''
''KB1/DEU1 DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   32       0           1                 0
''
''KB1/DEU3 DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   33       0           1                 0
''
''KB2/DEU2 DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   34       0           1                 0
''
''KB2/DEU3 DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   35       0           1                 0
''
''KB3/DEU4 DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   36       0           1                 0
''
```

j. Two datalinks for communication between PCMMU and Instrumentation (100037 through 100038) with a maximum transmission rate of 800 KBps.

The scripted inputs for these datalinks on IMSIM Specification Form 10 were as follows:

```
''
''PCM1/INSTRUMENTATION DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   37       0          100                0
''
''PCM2/INSTRUMENTATION DATALINK
''          MODE   TRANSMISSION RATE     TIME LAG
10   38       0          100                0
''
```

5.2.3.3 Workload Specifications. The activity which is to transpire in the DDPS model should reflect every significant activity of the DDPS itself. The IMSIM workload specification forms enable the model designer to maintain a close correlation between elements of the model workload and the actual DDPS workload. The DDPS processor, modules, and data transmissions are defined as tasks, routines, and messages for the model. Static characteristics for each of these system constituents are generally coded directly in the specification forms; however, the dynamic characteristics (those which change as a function of time or system state) are coded as "variables" as described in Sections 5.2.4.2 and 5.2.4.3, and only cross-references to the appropriate variables are included in the specification forms.

All coding for the specification forms is numeric, although comments are associated with each form to describe it for the reader. The following general conventions should be noted:

a. The form number appears as the first field of the form (1 - job step, 2 - task, 3 - routine, 5 - message, 11 - data set)

b. An * at the end of a form line indicates that the form is continued on the next line

c. The second field of a form identifies the member of the class defined by the form.

5.2.3.3.1 Job Definition. For the purpose of IMSIM representation of the DDPS workload, the entire activity within a GPC may be treated as a single job, consisting of a set of independently scheduled tasks. Since IMSIM permits the same type of task to be invoked for more than one job, task characteristics are divided into two classes: those which pertain to the type of task, and those which relate to the occasion in which the task appears as a step of a job. The latter are included in IMSIM Form 1 which is discussed in this section.

The DPPS job consists of 20 independent job steps, corresponding to the 20 types of tasks defined in Section 5.2.3.3.2. Each step is assigned a priority, which is subordinate to the task "service class". All of the steps are defined to be cyclic, even though some do not represent inherently cyclic processes; this is done to permit rescheduling of such steps according to events by IMSIM.

A Go/Nogo condition is specified for each step, to indicate the conditions under which it is to commence an execution cycle. The condition is coded as the number of a "variable" which is defined in Section 5.2.4; in general, each condition is a test of an indicator which is manipulated via logic described in Section 5.2.4.1. The step is held inactive while the condition variable is zero, and becomes active when the variable assumes a positive, nonzero value.

In the approach with four Virtual Machines a different job with identical job steps was assigned to each of the four GPCs. Output messages to MDMs were suppressed for jobs 3, 4, and 5, as only the active computer actually transmits these messages.

a. The scripted inputs for the jobs in Approach #1 with one VM (NASA.SPECS10.DATA) on IMSIM Specification Form 1 were as follows:

```
''JOBS
''  JOB      TASK        PRIORITY              NATURE      GO/NOGO
''                   RELATIVE ABSOLUTE      (CYCLIC)    VARIABLE
''           GEF                  28
 1   2         6         8                      2          401
''           AIE                  29
 1   2         7         9                      2          402
''           GAD                  26
 1   2         8         6                      2          403
''           GMA                  27
 1   2         9         7                      2          404
''           GEM                  24
 1   2        10         4                      2          405
''           SDA                  25
 1   2        11         5                      2          420
''           SDM                   5
 1   2        12         5                      2          421
''           SFO                  25
 1   2        13         5                      2          422
''           SPM                  25
 1   2        14         5                      2          423
''           GEN                   7
 1   2        15         7                      2          406
''           GMG                   6
 1   2        19         6                      2          408
''           GMS                   1
 1   2        20         1                      2          409
''           GMT,GMU,GMV           3
 1   2        21         3                      2          410
''           GMX                   2
 1   2        22         2                      2          411
''           GMY                   5
 1   2        23         5                      2          412
''           GTX                   4
 1   2        24         4                      2          413
''           DMI                  25
 1   2        32         5                      2          414
''           DMC                  23
 1   2        34         3                      2          416
''           DCI                  21
 1   2        35         1                      2          417
```

''	JOB	TASK	PRIORITY RELATIVE	PRIORITY ABSOLUTE	NATURE (CYCLIC)	GO/NOGO VARIABLE
''		ARA		9		
1	2	37	9		2	418

The scripted inputs for the four jobs in Approach #2 (four active Virtual Machines) on IMSIM Specification Form 1 were as follows:

''	JOB	TASK	PRIORITY RELATIVE	PRIORITY ABSOLUTE	NATURE (CYCLIC)	GO/NOGO VARIABLE
''		GEF		28		
1	2	6	8		2	401
''		AIE		29		
1	2	7	9		2	402
''		GAD		26		
1	2	8	6		2	403
''		GMA		27		
1	2	9	7		2	404
''		GEM		24		
1	2	10	4		2	405
''		SDA		25		
1	2	11	5		2	420
''		SDM		5		
1	2	12	5		2	421
''		SFO		25		
1	2	13	5		2	422
''		SPM		25		
1	2	14	5		2	423
''		GEN		7		
1	2	15	7		2	406
''		GMG		6		
1	2	19	6		2	408
''		GMS		1		
1	2	20	1		2	409
''		GMT,GMU,GMV		3		
1	2	21	3		2	410
''		GMX		2		
1	2	22	2		2	411
''		GMY		5		
1	2	23	5		2	412
''		GTX		4		
1	2	24	4		2	413
''		DMI		25		
1	2	32	5		2	414

JOB		TASK	PRIORITY RELATIVE	PRIORITY ABSOLUTE	NATURE (CYCLIC)	GO/NOGO VARIABLE
		DMC		23		
1	2	34	3		2	416
		DCI		21		
1	2	35	1		2	417
		ARA		9		
1	2	37	9		2	418
		GEF		28		
1	3	106	8		2	401
		AIE		29		
1	3	107	9		2	402
		GAD		26		
1	3	8	6		2	403
		GMA		27		
1	3	9	7		2	404
		GEM		24		
1	3	10	4		2	405
		SDA		25		
1	3	111	5		2	420
		SDM		5		
1	3	12	5		2	421
		SFO		25		
1	3	13	5		2	422
		SPM		25		
1	3	14	5		2	423
		GEN		7		
1	3	15	7		2	406
		GMG		6		
1	3	19	6		2	408
		GMS		1		
1	3	20	1		2	409
		GMT,GMU,GMV		3		
1	3	21	3		2	410
		GMX		2		
1	3	22	2		2	411
		GMY		5		
1	3	23	5		2	412
		GTX		4		
1	3	24	4		2	413
		DMI		25		
1	3	32	5		2	414
		DMC		23		
1	3	134	3		2	416
		DCI		21		
1	3	135	1		2	417
		ARA		9		
1	3	37	9		2	418

''	JOB	TASK	PRIORITY RELATIVE	PRIORITY ABSOLUTE	NATURE (CYCLIC)	GO/NOGO VARIABLE
''		GEF		28		
1	4	106	8		2	401
''		AIE		29		
1	4	107	9		2	402
''		GAD		26		
1	4	8	6		2	403
''		GMA		27		
1	4	9	7		2	404
''		GEM		24		
1	4	10	4		2	405
''		SDA		25		
1	4	111	5		2	420
''		SDM		5		
1	4	12	5		2	421
''		SFO		25		
1	4	13	5		2	422
''		SPM		25		
1	4	14	5		2	423
''		GEN		7		
1	4	15	7		2	406
''		GMG		6		
1	4	19	6		2	408
''		GMS		1		
1	4	20	1		2	409
''		GMT,GMU,GMV		3		
1	4	21	3		2	410
''		GMX		2		
1	4	22	2		2	411
''		GMY		5		
1	4	23	5		2	412
''		GTX		4		
1	4	24	4		2	413
''		DMI		25		
1	4	32	5		2	414
''		DMC		23		
1	4	134	3		2	416
''		DCI		21		
1	4	135	1		2	417
''		ARA		9		
1	4	37	9		2	418
''						
''		GEF		28		
1	5	106	8		2	401
''		AIE		29		
1	5	107	9		2	402
''		GAD		26		
1	5	8	6		2	403

''	JOB	TASK	PRIORITY		NATURE	GO/NOGO
''			RELATIVE	ABSOLUTE	(CYCLIC)	VARIABLE
''		GMA		27		
1	5	9	7		2	404
''		GEM		24		
1	5	10	4		2	405
''		SDA		25		
1	5	11	5		2	420
''		SDM		5		
1	5	12	5		2	421
''		SFO		25		
1	5	13	5		2	422
''		SPM		25		
1	5	14	5		2	423
''		GEN		7		
1	5	15	7		2	406
''		GMG		6		
1	5	19	6		2	408
''		GMS		1		
1	5	20	1		2	409
''		GMT,GMU,GMV		3		
1	5	21	3		2	410
''		GMX		2		
1	5	22	2		2	411
''		GMY		5		
1	5	23	5		2	412
''		GTX		4		
1	5	24	4		2	413
''		DMI		25		
1	5	32	5		2	414
''		DMC		23		
1	5	134	3		2	416
''		DCI		21		
1	5	135	1		2	417
''		ARA		9		
1	5	37	9		2	418
''						

5.2.3.3.2 Tasks. Each of the 20 scheduled processes of the DDPS which are relevant to the Mated/Drop Test was defined as an IMSIM task through use of the Form 2. The tasks were referenced in the definition of the DDPS job as described in the preceding section. Each task was assigned to one of two "service classes"; class 1 tasks obtain absolute priorities in the range 20-29, while class 5 tasks obtain absolute priorities of 0-9. The "delay" field indicated for Form 2 is not relevant to class 1 or 5 tasks, but must be filled in as a place-keeper (0 was used).

The process modules which are executed in a GPC are defined as "routines" as described in Section 5.2.3.3.3. Each module is called for execution in one or more processes, and the analog in the DDPS model is listing of routines as "Required Elements" of a task. The 5-digit numbers listed for each task (see the Form 2 table below) indicate the type of element and the individual of that type to be included for execution of the task. If the first digit is 3, the remaining digits identify a routine; if it is 5, the remaining digits identify a message (see Section 5.2.3.3.4).

Note that the amount of computation involved in performing a process was not directly associated with the task which represents the process, but rather with the routines which were employed for the task.

The tasks numbered 100 and higher were used for the simulation with four Virtual Machines.

The scripted inputs for the tasks on IMSIM Specification Form 2 were as follows:

```
''GEF_FC_EXEC   FAST CYCLE EXECUTIVE
''SCHEDULED AT 40MS INTERVALS BY GAV (20017) AND GAA (20016)
''         CLASS    DELAY     REQUIRED ELEMENTS
 2   6       1        0        30087  30301  50006  50007  50008  50009 *
                              50010  50011  50012  50013  50014  50015 *
                              50016  50017  50018  50019  50020  50021 *
                              50022  50023  50024  50025  50026  50027 *
                              50050  50051  50052  50053  50054  1
 2 106       1        0        30087  30301  1
''
''AIE_SIP   SYSTEM SOFTWARE INTERFACE PROCESSOR
''SCHEDULED AT 40MS INTERVALS BY SYSTEM INITIALIZATION
''         CLASS    DELAY     REQUIRED ELEMENTS
 2   7       1        0        30116  30130  30138  30147  50028         *
                              50058  30151  30140  1
 2 107       1        0        30116  30130  30138  30147  30151  30140 *
                              50028 1
''
''GAD_MATE_IDLE   MATED/DROP TEST IDLE MODE - 200
''SCHEDULED AT 40MS INTERVALS BY GAA (20016) UNTIL MODE TRANSITION
''         CLASS    DELAY     REQUIRED ELEMENTS
 2   8       1        0        30302  30303  30045  30089  1
''
```

```
''GMA_MIN_EXEC   MINOR CYCLE EXECUTIVE
''SCHEDULED AT 40MS INTERVALS BY GAV (20017).  IF MODE 200 IS
''ENTERED WHILE PLATFORM IS NOT RELEASED, GMA IS CANCELLED AND THEN
''RESCHEDULED AT MODE TRANSITION.
''         CLASS    DELAY     REQUIRED ELEMENTS
 2   9       1        0       30042  30303  30045  1
''
''GEM_MATE_DROP_EXEC   MATED/DROP EXECUTIVE
''SCHEDULED AT 80MS INTERVALS BY GAA (20016) FOR MODE 201.  IF MODE
''200 IS ENTERED, GEM IS CANCELLED.
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  10       1        0       30304  30303  30305  30306  30089  30087 *
                              30307  30312  30031  30315  1
''
''SDA_DATA_ACQUISITION   SM DATA ACQUISITION
''SCHEDULED AT 50MS INTERVALS BY SM OPS 1
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  11       1        0       30155  50032  50033  1
 2 111       1        0       30155  1
''
''SDM_PERFORM_MON_CONTROL   SM PERFORMANCE MONITORING CONTROL
''SCHEDULED AT 500MS INTERVALS BY SM OPS 1
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  12       5        0       30316  30317  1
''
'' SFO_FLIGHT_OPS   SM FLIGHT OPERATIONAL SEQUENCE (OPS 2)
''SCHEDULED BY UI SOFTWARE (20034)
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  13       1        0       30157  30316  1
''
''SPM_SUBSYS_CONFIG_MON   SM SUBSYSTEM CONFIGURATION MONITORING
''PRETAKEOFF & PREDROP SM SPECS SCHEDULED BY UI SOFTWARE (20034)
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  14       1        0       30157  1
''
''GEN_TAEM_NAV_CYC   TAEM NAVIGATION CYCLIC EXECUTIVE
''SCHEDULED AT 2000MS INTERVALS BY SPEC GUC (20027) UPON PLATFORM
''RELEASE REQUEST
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  15       5        0       30306  30308  1
''
''GMG_MAJ_EXEC   IMU MAJOR CYCLE EXECUTIVE
''SCHEDULED AT 320MS INTERVALS BY GMU/GMT/GMV (20021), GMX (20022),
''GMY (20023), AND GMS (20020), ALL OF WHICH ARE SCHEDULED BY
''SPEC GUC (20027).
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  19       5        0       30309  30305  1
```

```
''GMS_IMU_ATT   IMU ATTITUDE DETERMINATION
''SCHEDULED BY GUC (20027)
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  20       5        0        30310  1
''
''GMT_PFLT_CALA   IMU PREFLIGHT CALIBRATION A
''GMU_HANG_CALA   IMU HANGAR CALIBRATION    A
''GMV_HANG_CALB   IMU HANGAR CALIBRATION    B
''SCHEDULED BY GUC (20027)
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  21       5        0        30311  1
''
''GMX_GC_ALIGN   IMU GYROCOMPASS ALIGNMENT
''SCHEDULED BY GUC (20027)
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  22       5        0        30062  1
''
''GMY_VEL_TILT   IMU VELOCITY AND TILT
''SCHEDULED BY GUC (20027) TO FOLLOW GMX (20022)
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  23       5        0        30063  1
''
''GTX_DD_CKOUT   FCS/DD DEDICATED DISPLAY CHECKOUT
''SCHEDULED BY GUG (20028)
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  24       5        0        30113  1
''
''DMI_MCDS_IN   MCDS INPUT PROCESSOR
''SCHEDULED AT 200MS INTERVALS BY SYSTEM INITIALIZATION
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  32       1        0        30148  30149  1
'
''[illegible]_SUPER   USER INTERFACE
 SCHEDULED BY SYSTEM INITIALIZATION
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  34       1        0        30313  50059  50060  1
''
 2 134       1        0        30313  1
''DCI_CYC_DISPLAY   CYCLIC DISPLAY PROCESSING
''SCHEDULED AT 100MS INTERVALS BY SYSTEM INITIALIZATION
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  35       1        0        30314  50055  50056  50057  1
 2 135       1        0        30314  1
''
''ARA_GPC_SWITCH   GPC SWITCH MONITOR
''SCHEDULED AT 1000MS INTERVALS BY SYSTEM INITIALIZATION
''         CLASS    DELAY     REQUIRED ELEMENTS
 2  37       5        0        30118  1
''
```

5.2.3.3.3 Routines. The program modules which are called for DDPS processes are represented as IMSIM "routines". An IMSIM Form 3 is used to define each routine. As a practical consideration, a one-one correspondence between routines and modules was not maintained; instead, modules which are collectively employed for a process are grouped together and treated as a single routine. The conditions under which individual modules are exercised and to what extent they perform computation is represented by segments of the "Computation Time" function associated with each routine. These functions are defined and discussed in Section 5.2.4.2.

For each Form 3 listed below, comments are included to indicate which modules were represented by the routine. If the routine is to be used for more than one task, the "Share" code must be 1; otherwise its value is irrelevant.

A number of fields of Form 3 are not significant to simulation of the DDPS but must be filled with acceptable values for proper operation of IMSIM. Thus, a "Library Data Set" is specified for reading of routines from some external source in case they are not resident in memory (which they are); "Size" for each routine is given although analysis of memory loading is not being conducted and the values are therefore only set to a nominal value of 1; the "Time" field indicates an optional cutoff of computation and 0 indicates that no cutoff is desired; since there is only one class of processor being simulated (the CPU) it is nominally defined as a class 10; finally since there is only a single memory unit for each GPC, and one GPC was being simulated as the active transmitting computer for each Virtual Machine while the other three were simulated as redundant, the memory is designed as a variable function of the job being executed.

The scripted inputs for these routines on IMSIM Specification Form 3 were as follows:

```
''
''TAEM GUIDANCE   (TASK 10)
''   GGA_TAEM_GUID
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3  31    1    110001       1          0     10      442   359 0
''
''IMU MINOR CYCLE EXECUTIVE   (TASK 9)
''   GMA_MIN_EXEC
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3  42    1    110001       1          0     10      442   355 0
''
''IMU RESOLVER PROCESSOR   (TASKS 8, 9)
''   GMD_RES_PROC
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3  45    1    110001       1          0     10      442   356 0
''
''IMU GYRO-COMPASS ALIGNMENT   (TASK 22)
''   GMX_GC_ALIGN
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3  62    1    110001       1          0     10      442     16 0.4
```

```
''
''IMU VELOCITY TILT   (TASK 23)
''   GMY_VEL_TILT
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3  63    1    110001       1          0    10       442   397 0.26
''
''FDI FCS SELECTION FILTER   (TASKS 6, 10)
''   GRA_FCS_SF
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3  87    1    110001       1          0    10       442   16 0.206
''
''FDI NAVAID SELECTION FILTER   (TASKS 8, 10)
''   GRC_NAVAID_SF
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3  89    1    110001       1          0    10       442   16 0.019
''
''DD DEDICATED DISPLAY CHECKOUT   (TASK 24)
''   GTX_DD_CKOUT
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 113    1    110001       1          0    10       442     16 0.4
''
''SYSTEM INTERFACE PROCESSOR   (TASK 7)
''   AIE_SIP
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 116    0    110001      800         0    10       442   16 0.656
''
''GPC SWITCH MONITOR   (TASK 37)
''   ARA_GPC_SWITCH
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 118    0    110001     1300         0    10       442   16 0.214
''
''GPC DOWNLIST FORMATTER   (TASK 7)
''   DCD_DOWNLIST
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 130    0    110001     2000         0    10       442   16 0.24
''
''ICC MESSAGE COLLECTOR   (TASK 7)
''   DIM_ICC_COLLECTOR
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 138    1    110001      940         0    10       442   16 0.323
''
''LIGHTS AND ALARM PROCESSING   (TASK 7)
''   DLA_LIGHT_ALARM_PROC
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 140    1    110001     1600         0    10       442   430 0.24 10
''
''ICC MESSAGE ROUTER   (TASK 7)
''   DME_ICC_ROUT
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 147    1    110001     1260         0    10       442   16 0.087
''
```

```
''MCDS INPUT PROCESSOR   (TASK 32)
''   DMI_MCDS_IN
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 148   0    110001      400          0     10      442   16 0.18
''
''MCDS MESSAGE PROCESSOR  (TASKS 32, 33)
''   DMM_MCDS_PROCESS
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 149   1    110001     2200          0     10      442   432
''
''FAULT MESSAGE SCAN   (TASK 7)
''   DMS_FMS
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 151   1    110001      480          0     10      442  429 0.216 10
''
''SYSTEMS MANAGEMENT DATA ACQUISITION (TASK 11)
''   SDA_DATA_ACQUISITION
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 155   1    110001        1          0     10      442   386    0
''
''SUBSYSTEM CONFIGURATION MONITORING (TASKS 13, 14)
''   SPM_SUBSYS_CONFIG_MON
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 157   1    110001        1          0     10      442    16 0.0456
''
''FLIGHT CONTROL   (TASK 6)
''   GEF_FC_EXEC            FAST CYCLE EXECUTIVE
''   GPN_DP_1               DATA PROCESSING 1
''   GPO_DP_2               DATA PROCESSING 2
''   GPP_CMDS_PROC          COMMANDS PROCESSOR
''   GRB_SWITCH_SF          FDI SWITCH SELECTION FILTER
''   GCA_PTCH_CE            PITCH CONTROL ELEMENT
''   GCB_RY_CE              ROLL/YAW CONTROL ELEMENT
''   GCC_BF_CE              BODY FLAP CONTROL ELEMENT
''   GCD_ELVTR_AUTO_CE      ELEVATOR AUTO CONTROL ELEMENT
''   GCE_ELVTR_MD_CE        ELEVATOR MAN-DIR CONTROL ELEMENT
''   GCF_ELVTR_CAS_CE       ELEVATOR CAS CONTROL ELEMENT
''   GCG_ALRN_AUTO_CE       AILERON AUTO CONTROL ELEMENT
''   GCH_ALRN_MD_CE         AILERON MAN-DIR CONTROL ELEMENT
''   GCI_ALRN_CAS_CE        AILERON CAS CONTROL ELEMENT
''   GCJ_RDR_AUTO_CE        RUDDER AUTO CONTROL ELEMENT
''   GCK_RDR_MD_CE          RUDDER MAN-DIR CONTROL ELEMENT
''   GCL_RDR_CAS_CE         RUDDER CAS CONTROL ELEMENT
''   GCM_NW_CE              NOSEWHEEL CONTROL ELEMENT
''   GCQ_SYS_CHKOUT         CHECKOUT
''   GCR_RECON_INIT         RECONFIGURATION & INITIALIZATION
''   GCS_SCHED_GAINS        SCHEDULE GAINS - CONTROL LAWS
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 301   0    110001        1          0     10      442   350 0
```

```
''
''MATED/DROP CONTROL    (TASK 8)
''    GAA_OPS2_MATED_DROP_TST  OPS CONTROL SEGMENT
''    GAD_MATE_IDLE            IDLE PROCESSOR
''    GME_FLT_ATT              IMU FLIGHT ATTITUDE PROCESSOR
''       SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 302    0    110001       1          0     10       442    361 0
''
''IMU BITE PROCESSING, ACCELEROMETER ACCUMULATOR, & GYRO TORQUING
''(TASKS 8, 9, 10)
''    GMB_IMU_BITE
''    GMC_ACP_ACUM
''    GMF_GYO_TORQ
''       SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 303    1    110001       1          0     10       442    362 0
''
''DISPLAYS AND IMU MODING    (TASKS 10, 18)
''    GDA_DED_DISP_PROC        DEDICATED DISPLAY PROCESSOR
''    GDB_AVVI_AMI_PROC        DEDICATED DISPLAY, AVVI, AMI PROCESSOR
''    GDE_ADI_PROC             DEDICATED DISPLAY ADI PROCESSOR
''    GDF_HSI_PROC             DEDICATED DISPLAY HSI PROCESSOR
''    GDZ_DISP_PROC            CRT DISPLAY PROCESSOR
''    GMN_IMU_MODING           IMU MODING
''    GPC_AD_CALC              AIR-DATA CALCULATIONS
''       SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 304    1    110001       1          0     10       442    390 0
''
''IMU GYRO AND ACCELEROMETER FUNCTIONS    (TASKS 10, 19)
''    GMH_ACP_COMP         IMU ACCELEROMETER COMPENSATION
''    GML_ACP_TRSF         IMU ACCELEROMETER PULSE TRANSFORMATION
''    GMK_GYO_COMP         IMU GYRO COMPENSATION
''       SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 305    1    110001       1          0     10       442    16 1.344
''
''NAVIGATION    (TASKS 10, 15)
''    GNA_MLS_MEAS         MSBLS MEASUREMENT PROCESSING
''    GNB_TACAN_MEAS       TACAN MEASUREMENT PROCESSING
''    GNC_BARO_ALT         BARO-ALTIMETER MEASUREMENT PROCESSING
''    GND_RADAR_ALT        RADAR-ALTIMETER MEASUREMENT PROCESSING
''    GNE_NAV_EXEC         NAVIGATION EXECUTIVE
''    GN1_DATA_SNAP        DATA SAVING
''    GN3_MEAS_SCHDLR      MEASUREMENT SCHEDULER
''    GN7_NAV_FILTER       FILTER
''       SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 306    1    110001       1          0     10       442    368 0.15
''
''GUIDANCE    (TASK 10)
''    GGB_AL_GUID          APPROACH/LANDING GUIDANCE
''       THE FOLLOWING ARE CONTROLLED VIA GGB
```

```
''   GGC_P_TRAJ          PITCH TRAJECTORY
''   GGD_TRAJ_CAP        TRAJECTORY CAPTURE
''   GGE_SGS             STEEP GLIDESLOPE
''   GGF_F_SGS           FLARE & SHALLOW GLIDESLOPE
''   GGG_FF              FINAL FLARE
''   GGH_P_SYNC          PITCH SYNCHRONIZATION
''   GGI_R_CMD           ROLL COMMAND
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 307   1    110001      1          0     10      442    370 0
''
''TAEM NAVIGATION   (TASK 15)
''   GEN_TAEM_NAV_EXEC   CYCLIC EXECUTIVE
''   GN2_INFLT_HARDSTAND INFLIGHT/HARDSTAND UPDATE
''   GN4_COV_RECONFG     STATE & COVARIANCE RECONFIGURATION
''   GN5_AVG_G_DP        DOUBLE PRECISION AVERAGE G
''   GN6_COV_PROP        COVARIANCE MATRIX PROPAGATION
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 308   1    110001      1          0     10      442    357 0
''
''IMU MAJOR FUNCTIONS   (TASK 19)
''   GMG_MAJ_EXEC        MAJOR CYCLE EXECUTIVE
''   GMI_T_UPDATE        TRANSFORM UPDATE
''   GMJ_TOR_TRSF        TORQUING TRANSFORM
''   GMM_LAT_FUNC        LARGE ANGLE TORQUING
''   GMQ_LSF_FILR        LEAST SQUARES FILTER
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 309   1    110001      1          0     10      442    353 0
''
''IMU ATTITUDE AND NAV-BASE TO CLUSTER TRANSFORMATION   (TASK 20)
''   GMS_IMU_ATT
''   GMP_TNB_CL
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 310   1    110001      1          0     10      442    354 0
''
''IMU CALIBRATION   (TASK 21)
''   GMU_HANG_CALA       HANGAR CALIBRATION A
''   GMV_HANG_CALB       HANGAR CALIBRATION B
''   GMT_PFLT_CALA       PREFLIGHT CALIBRATION A
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 311   1    110001      1          0     10      442    16 30.0
''
''REDUNDANCY MANAGEMENT   (TASKS 10, 18)
''   GRE_FDIR            FDI SEQUENCER
''      THE FOLLOWING ARE CONTROLLED BY GRE
''   GRF_TRANS_FDIR      TRANSDUCER SEQUENCER
''   GRG_ACT_FDBK_FDIR   ACTUATOR FEEDBACK SEQUENCER
''   GRH_SWT_FDIR        SWITCH SEQUENCER
''   GRI_RGA_FDIR        RATE-GYRO SEQUENCER
```

```
''   GRJ_AA_FDIR          ACCELEROMETER ASSEMBLY
''   GRK_RA_FDIR          RADAR ALTIMETER
''   GRL_IMU_FDIR         IMU SEQUENCER
''   GRM_ADTA_FDIR        ADTA SEQUENCER
''   GRN_TACAN_FDIR       MSBLS SEQUENCER
''   GRO_MSBLS_FDIR       MSBLS SEQUENCER
''   GRP_BF_FDIR          BODY FLAP SEQUENCER
''     SHARE  LIB.DS      SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 312   1    110001       1          0     10      442   428 0
''
''USER INTERFACE SUPERVISOR   (TASK 34)
''   DMC_SUPER            USER INTERFACE CONTROL SUPERVISOR
''   DMC_FUNCTIONS        KEYBOARD FUNCTIONS
''   DMC_APP_INT          APPLICATION CONTROL INTERFACE
''   DMC_MCDS_CNT         MCDS DISPLAY CONTROL
''   DMC_APP_KEY_PROCESS APPLICATION KEYS PROCESSING
''   DMC_DISPLAY          DISPLAY COORDINATION
''   DMC_NEW_DISPLAY      NEW DISPLAY PROCESSING
''   DMC_SEQ_REQ_PROC     SEQUENCE REQUEST PROCESSING
''   DIM_ICC_COLLECTOR    ICC MSG COLLECTOR
''     SHARE  LIB.DS      SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 313   0    110001     10380        0     10      442   431
''
''CYCLIC DISPLAY PROCESSING   (TASK 35)
''   DCI#CYC              CYCLIC DISPLAY PROCESSING
''   DCI#CON              DATA CONVERSION
''   DCI#FMT              DATA FORMATTING
''     SHARE  LIB.DS      SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 314   0    110001      5252        0     10      442   435 2.06 8.3
''
''MATED DROP, WARMUP, AND RAW DATA PROCESSING   (TASKS 10, 18)
''   GEM_MATE_DROP_EXEC   MATED/DROP EXECUTIVE
''   GGJ_AVG_G_SP         SINGLE PRECISION AVERAGE G
''   GGK_USER_PARAM       USER PARAMETERS
''   GPA_ADTA_DATA_PROC   ADTA DATA PROCESSOR
''   GPM_MSBL_DATA_PROC   MSBLS DATA PROCESSOR
''   GPR_RA_DATA_PROC     RADAR ALTIMETER PROCESSOR
''   GPT_TACAN_DATA_PROC TACAN DATA PROCESSOR
''   GTM_TACAN_WARMUP     TACAN WARM-UP
''   GTP_MSBLS_WRMUP      MSBLS WARM-UP
''   GTR_RA_WRMUP         RADAR ALTIMETER WARM-UP
''     SHARE  LIB.DA      SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 315   0    110001       1          0     10      442   396 0
''
```

```
''SYSTEMS MANAGEMENT PERFORMANCE MONITORING (TASKS 12, 13)
''   SFD_FAULT_DETECT_ANNUN        FAULT DETECTION & ANNUNCIATION
''   SPP_PRECON_PROCESS            PRECONDITION PROCESSING
''   SSC_SPECIAL_COMP              SPECIAL COMPUTATIONS
''   SAS_ANALOG_SCALE              ANALOG SCALING
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 316   1    110001        1          0     10      442   425     0
''
''PERFORMANCE MONITORING CONTROL (TASK 12)
''   SPM_PERFORM_MON_CONTROL       PM CONTROL
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME
 3 317   1    110001        1          0     10      442   387
''
```

5.2.3.3.4 Messages. All data transmissions performed by the IOP of the GPC being simulated were defined as messages using IMSIM Form 5. Other transmissions were not simulated as they had no impact on loading of the GPC under study; i.e., they did not occupy resources of the GPC and, due to the configuration of the DDPS, could not interface with transmissions controlled by the GPC.

Each Read transmission is preceded by a Write transmission to query the appropriate device. Although a message defined via Form 5 represents a type of transmission, it may represent one or more occurrences of the transmission, each with different source, destination, length, etc. These capabilities are employed in characterizing DDPS transmissions for the model, and are best illustrated by example. Consider the pair of message definitions 6 and 7 as shown in the list of forms below (the first two lines which begin with the number 5). As indicated by the "Total" field, each of these messages represents three transmissions. Message 6 represents a sequence of Write transmissions (from memory 1, denoted by 70001) to a destination denoted by Variable 380. This variable is described in Section 5.2.4; in essence, it states that the destination for the first (of three) transmissions is the Multiplexer/Demultiplexer for the Flight Critical Forward Instruments #3 (60011), that the second is Multiplexer/Demultiplexer for the Flight Critical Forward Instruments #2 (60010), and that the third is Multiplexer/Demultiplexer for Flight Critical Forward Instruments #1 (60009).

The "Length" and "Interval" fields are each comprised of three subfields; the value 16 in the first subfield denotes a constant length (12 characters) or interval (1 ms), as indicated by the second subfield (the third subfield is not used for the DDPS model). "Length" is expressed in terms of 8-bit characters of data transmitted, and transmission rates for hardware (as described in Section 5.2.3.2) are adjusted to compensate for the added control bits of each transmission. The "Nature" of message 6 is given as 0 - indicating that it can only be initiated when the task has been activated - and the "Start" of 1 causes the first transmission to be initiated 1 ms after the task commences.

Message 7 represents the response to message 6 and its transmission is correlated on a one-one basis with transmission of message 6 by specifying Nature 2 and giving the "Source" of the message as message 6 (50006). Note that in this situation, transmission of message 7 is triggered by completion of a message 6 transmission, and the source of message 7 is taken to be the sink of message 6. Message transmissions were simulated whenever a task was activated which includes the message among its required elements (see Section 5.2.3.3.2). Interference in accessing system components for transmission is automatically handled by IMSIM according to hardware and configuration specifications included in Forms 6 through 12.

The scripted inputs for these messages on IMSIM Specification Form 5 were as follows:

```
''READ FROM FF01, FF02, FF03 -
''   ACCELEROMETER ASSEMBLY (ACCLRM)
''   ROTATIONAL HAND CONTROLLER 1 & 2 (LH RHC, RH RHC)
''   SPEEDBRAKE THRUST CONTROLLER 1 & 2 (SBTC)
''   RUDDER PEDAL TRANSDUCER ASSEMBLY 1 & 2 (RPTA)
''   FF MDM DISCRETES
''     NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5   6   0     70001    380  16 12 0     16  1 0      1      3
 5   7   2     50006  70001  16 56 0     16  0 0      0      3
''
''READ FF04 MDM DISCRETES
''     NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5   8   0     70001  60012  16  2 0     16  0 0      1      1
 5   9   2     50008  70001  16 24 0     16  0 0      0      1
''
''READ IMU FROM FF01, FF02, FF03
''     NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  10   0     70001    380  16  2 0     16  1 0      1      3
 5  11   2     50010  70001  16 28 0     16  0 0      0      3
''
''READ FROM FF01 -
''   FWD ATTACH POINT VOLTAGE (LCA)
''   AIR DATA TRANSDUCER ASSEMBLY (ADTA)
''   MSBLS
''   TACAN AND TACAN REGISTER
''   RADAR ALTIMETER (RAD ALT)
''     NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  12   0     70001  60009  16 12 0     16  0 0      1      1
 5  13   2     50012  70001  16 32 0     16  0 0      0      1
''
''READ FROM FF02 -
''   ADTA
''   MSBLS
''   TACAN AND TACAN CONTROL REGISTER
''   RAD ALT
''     NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  14   0     70001  60010  16 10 0     16  0 0      1      1
 5  15   2     50014  70001  16 34 0     16  0 0      0      1
''
''READ FROM FF03 -
''   LCA
''   ADTA
''   MSBLS
''   TACAN AND TACAN CONTROL REGISTER
''     NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  16   0     70001  60011  16 10 0     16  0 0      1      1
 5  17   2     50016  70001  16 30 0     16  0 0      0      1
```

```
''
''READ ADTA FROM FF04
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  18    0     70001  60012  16  2 0     16  0 0      1      1
 5  19    2     50018  70001  16 14 0     16  0 0      0      1
''
''READ CLOCK (MTU) FROM FF01, FF02, FF03
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  20    0     70001    380  16  2 0     16  1 0      1      3
 5  21    2     50020  70001  16 14 0     16  0 0      0      3
''
''READ FROM FA01, FA02, FA03 -
''   RATE GYRO ASSEMBLY
''   FA MDM DISCRETES
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  22    0     70001    381  16  6 0     16  1 0      1      3
 5  23    2     50022  70001  16 18 0     16  0 0      0      3
''
''READ FROM FA04
''   ACTUATOR POSITION FEEDBACKS (ASA)
''   FA MDM DISCRETES
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  24    0     70001  60016  16  6 0     16  0 0      1      1
 5  25    2     50024  70001  16 26 0     16  0 0      0      1
''
''READ FROM FA01, FA02 -
''   AFT ATTACH POINT VOLTAGE (LCA)
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  26    0     70001    381  16  2 0     16  1 0      1      2
 5  27    2     50026  70001  16 12 0     16  0 0      0      2
''
''ICC FOR REDUNDANT SET
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  28    0       383    384  16 256 0    16  0 0      0      1
''
''READ DISPLAY FORMAT FROM MASS MEMORY
''NOT USED IN ALT
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
''  30    0     70001 110002  16   2 0    16  0 0      1      1
''  31    2     50030  70001  16 1024 0    16  0 0      0      1
''
''READ PERFORMANCE DATA FROM PCMMU
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  32    0     70001  60095  16 256 0     16  1 0      1      1
 5  33    2     50032  70001  16 256 0     16  0 0      0      1
''
```

```
''WRITE TO FF01, FF02, FF03 -
''   TACAN CONTROL REGISTER
''   FF MDM DISCRETES
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  50   0      70001    380  16 52 0     16  0 0      0      3
''
''WRITE FF MDM DISCRETES TO FF04
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  51   0      70001  60012  16 48 0     16  0 0      0      1
''
''WRITE IMU TO FF01, FF02, FF03
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  52   0      70001    380  16  4 0     16  0 0      0      3
''
''WRITE TO FA01, FA02, FA03, FA04 -
''   AERO SURFACE SERVO AMPLIFIER (ASA)
''   FA MDM DISCRETES
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  53   0      70001    381  16 36 0     16  0 0      0      4
''
''WRITE TO DDU1, DDU2 -
''   AVVI
''   AMI
''   ADI
''   HSI
''   SPI
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  54   0      70001    382  16 72 0     16  0 0      0      2
''
''WRITE TO DEU1, 2, AND 3   (TASK 34)
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  55   0      70001  60001  16 1024 0   16  0 0      1      1
 5  56   0      70001  60002  16 1024 0   16  0 0      1      1
 5  57   0      70001  60003  16 1024 0   16  0 0      1      1
''
''WRITE PRIME FRAME TO PCMMU
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  58   0      70001  60095  16 512 0    16  0 0      0      1
''
''READ KEYBD 1 AND WRITE NEW DISPLAY TO DEU1
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  59   0      60027  70001  434  0 0    16  0 0      0      1
 5  60   2      5Q059  60001  433  0 0    16  1 0      0      1
''
```

5.2.3.3.5 Data Sets. Data sets represent files of data allocated to auxiliary storage. For representation of the DDPS, two data sets were defined, as shown in the Form 11 listing below. Data set 1 represents the library file from which major function overlays are selected for main memory. Since simulation of the Mated/Drop Test does not include the overlay function, it is performed as part of the initializing process of the model; nevertheless, a library data set must be specified for each routine to be addressed, and the data set must be defined.

Data set 2 represents one of the mass storage files for display images. Only one is represented as only one is to be used for a given system configuration.

Both data sets are assigned to storage 1 (mass storage facility) and are defined to be serially addressed ("Org" = 0). The "Initial Size" and "Maximum Size" for a data set are separately specifiable to permit dynamic change in the data content of a data set; however, this feature is not required for DDPS Simulation, and therefore, both fields are specified as the same: 10^7 characters for the library, and 1.024×10^7 characters for the displays.

The scripted inputs for these data sets on IMSIM Specification Form 11 were as follows:

```
''
''      STORAGE    ORG    INIT.SIZE    MAX.SIZE
''
11    1     1        0        10000        10000
11    2     1        0        10240        10240
''
```

5.2.3.3.6 Executive Algorithms. IMSIM Form 13 is used to select from among various options the methods to be used by IMSIM in performing some of the functions normally relegated to executive or operating systems of computers. While some are not relevant to DDPS Simulation, they are all specified and listed below with clarification as needed.

```
'' ALGORITHM SELECTION
''
''      1A   1B   2A   2B   2C   2D   2E   3A   3B   3C   4A   4B   5A   5B   6A
13       1    0    1    1    0    0    0    1    1    1    1    1    0    0    0
''
```

1A If alternative paths between a source and sink are available, but all are in use when a transmission is to be performed, defer the transmission until any path becomes available.

1B If more than one path for a transmission is open, choose the first one in the list.

2A, 2B, 2C, 2D, 2E — These options pertain to memory allocation and are not meaningful for the DDPS simulation.

3A, 3B — Processing is interruptible for executive functions and for tasks of service class 1.

3C Scheduling precedence is determined by task priority.

4A This option pertains to use of nonsharable systems components (other than a CPU) by tasks, and is not relevant to DDPS Simulation.

4B All transmissions are to be over explicity defined data links, i.e., no implicit links are allowed.

5A, 5B — These options pertain to simulation of program loading, and are not relevant to the DDPS Simulation.

6A The CPU is not to be interrupted in performing a task in order to initiate and service I/O (this function is performed by the IOP of the DDPS).

5.2.4 Model Adaptation and Parameterization (S.O.W. 2.1.4)

The following paragraphs under this section describe in detail the work performed under this task. In summary it entailed:

a. Logic changes made to IMSIM to accommodate NASA-unique simulation, which include:
   1. Cyclic activation of functions
   2. Dynamic setting of conditions through the jobschedule
   3. Delivery of computational units by the routines through the setting of gates and savex cells
   4. Suppression of zero-length transmission
   5. Deletion of segments of IMSIM not pertaining to the NASA simulation to reduce computer simulation run time
   6. Incoproration of a checkpoint capability

b. Incorporation of a new report #2 in IMSIM to better reflect the status of task activations and cyclic operations.

   The reports for message traffic were revised for easier reading.

c. Defining a total of 100 new variables for:
   1. Stipulating functional conditions for delivering computation time by routines
   2. Defining sources and sinks and message length for data messages
   3. Determining conditions for operations of functions
   4. Calculating time slices
   5. Clearing keyboard inputs
   6. Determining branch locations dependent upon operational conditions
   7. Time slice setting and counters

d. Parameterizing the model with the parameters reflecting the simulaced hardware and software as described in detail in paragraph 5.2.3.

5.2.4.1 NASA-Unique IMSIM Revisions. IMSIM was adapted for NASA-unique conditions with the following changes:

a. Facilitate cyclic activation of functions
b. Dynamic setting of conditions through the jobschedule
c. Delivery of computational units by routines
d. Suppression of zero-length transmission
e. Deletion of segments of IMSIM not pertinent to the NASA simulation

5.2.4.1.1 Cyclic Activation of Functions. In order to facilitate the operation of cyclic functions at various intervals, transactions were generated at each of the intervals, parameter 3 (P3) was set with the unique gate number for that function, and parameter 4 (P4) was set with the unique task number for that function. The gate was used for intercommunication with the prototype task and was closed again after task was activated. The transactions were only admitted if the conditions for operation of that function were met.

Cyclic activation took place at the following intervals for the specified functions as given in Table 5-1 below.

Table 5-1. Cyclic Activation of Functions

INTERVAL	FUNCTION NAME	FUNCTION DESIGNATOR	TASK NUMBER	GATE
40 ms	System Software Interface Proc	AIE	7	1502
	Minor Cycle Executive	GMA	9	1504
	Fast Cycle Executive	GEF	6	1501
	Mated/Drop Idle Mode	GAD	8	1503
50 ms	S.M. Data Acquisition	SDA	1,	1520
80 ms	Mated/Drop Executive	GEM	10	1505
100 ms	Cyclic Display Processing	DCI	35	1517
200 ms	MCDS Input Processor	DMI	32	1514
320 ms	IMU Major Cycle Executive	GMG	19	1508
500 ms	S.M. Performance Monit. Cntrl.	SDM	12	1521
1000 ms	GPC Switch Monitor	ARA	37	1518
2000 ms	TAEM Navigation Cyclic Exec.	GEN	15	1506
2 ms	S.M. Flight Ops 2	SFO	13	1522
	User Interface	DMC	34	1516
	S.M. Subsystem Conf. Monitor	SPM	14	1523
	FCS Dedicated Display Checkout	GTX	24	1513
	IMU Attitude Determination	GMS	20	1509
	IMU Calibration	GMT,GMU,GMV	21	1510
	IMU Gyro Alignment	GMX	22	1511
	IMU Velocity & Tilt	GMY	23	1512

The logic for this change is depicted in Figure 5-2 giving the flow diagrams for this logic. Reference 1, the MODLIT Reference Manual, details the symbols and code used in these flow diagrams.

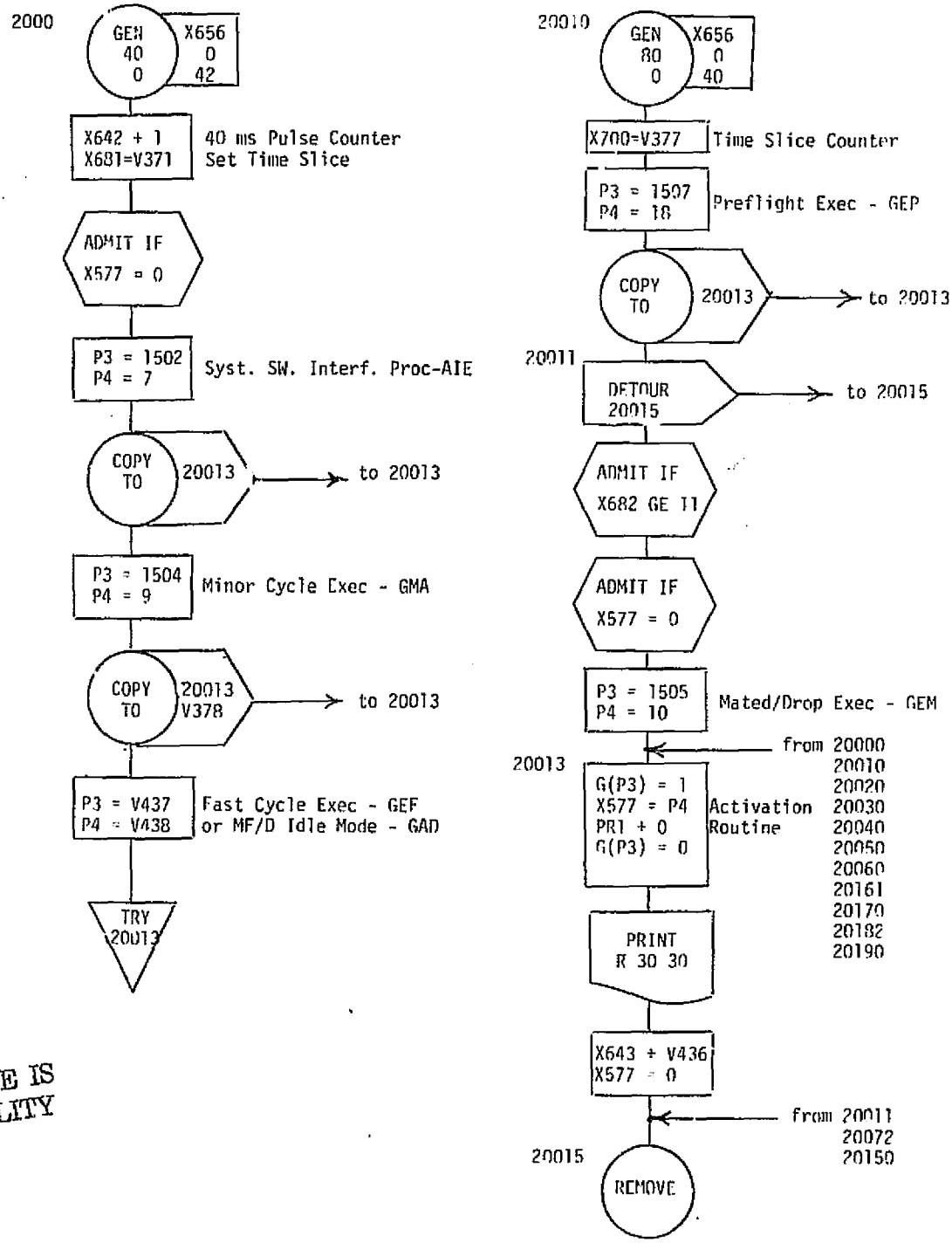

Figure 5-2. Flow Diagrams for Cyclic Activation of Functions

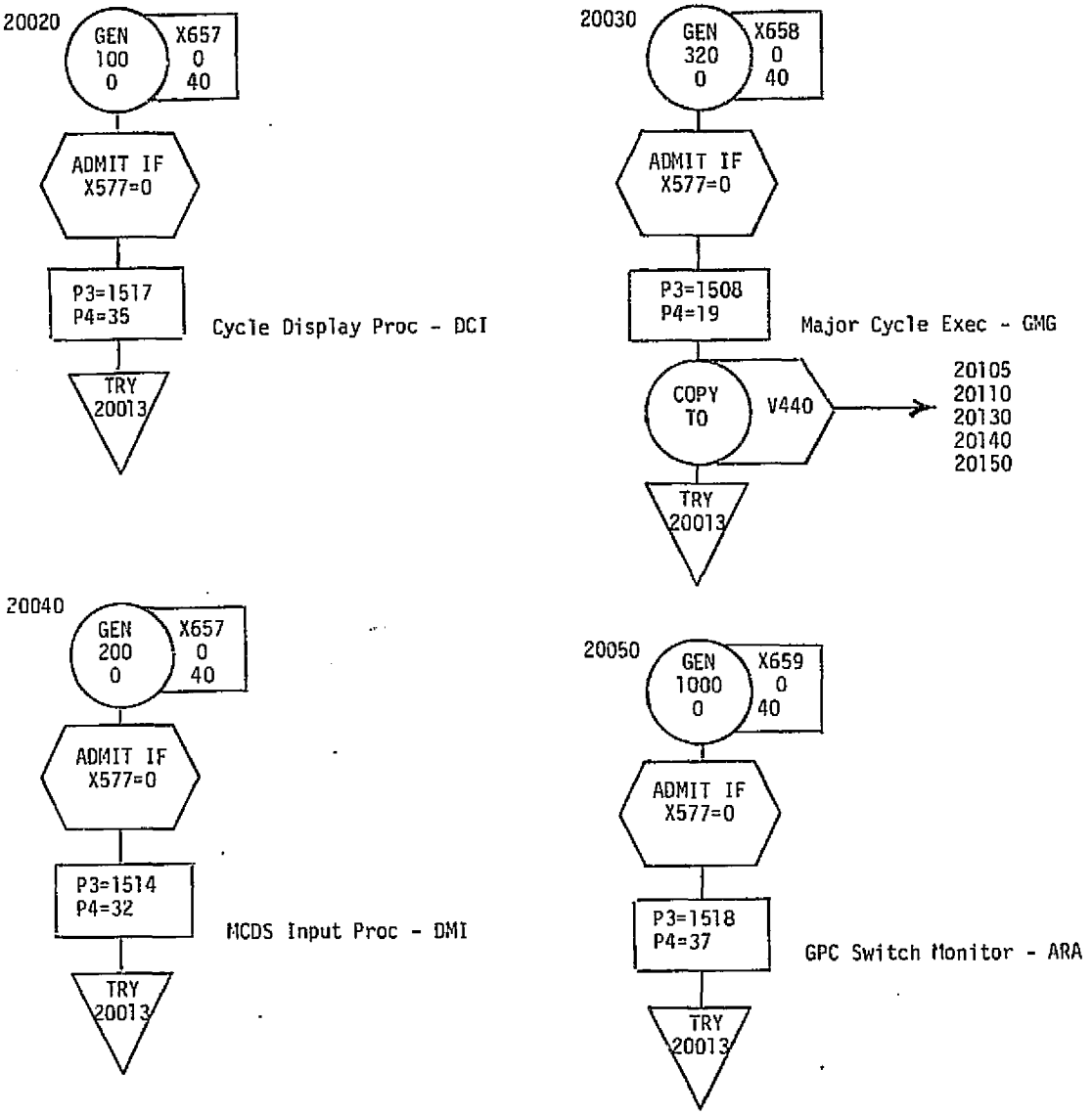

Figure 5-2 (cont)

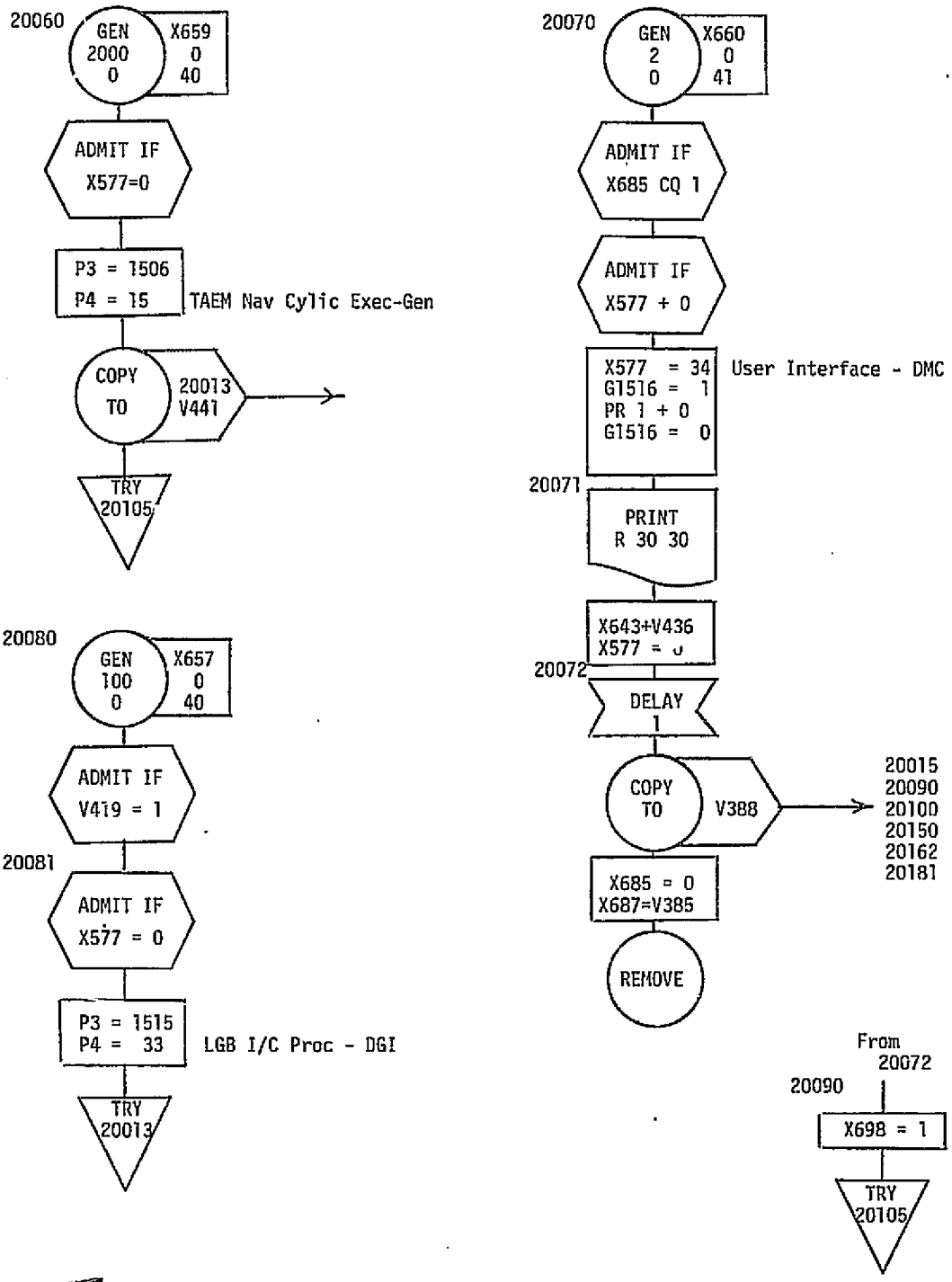

Figure 5-2 (cont)

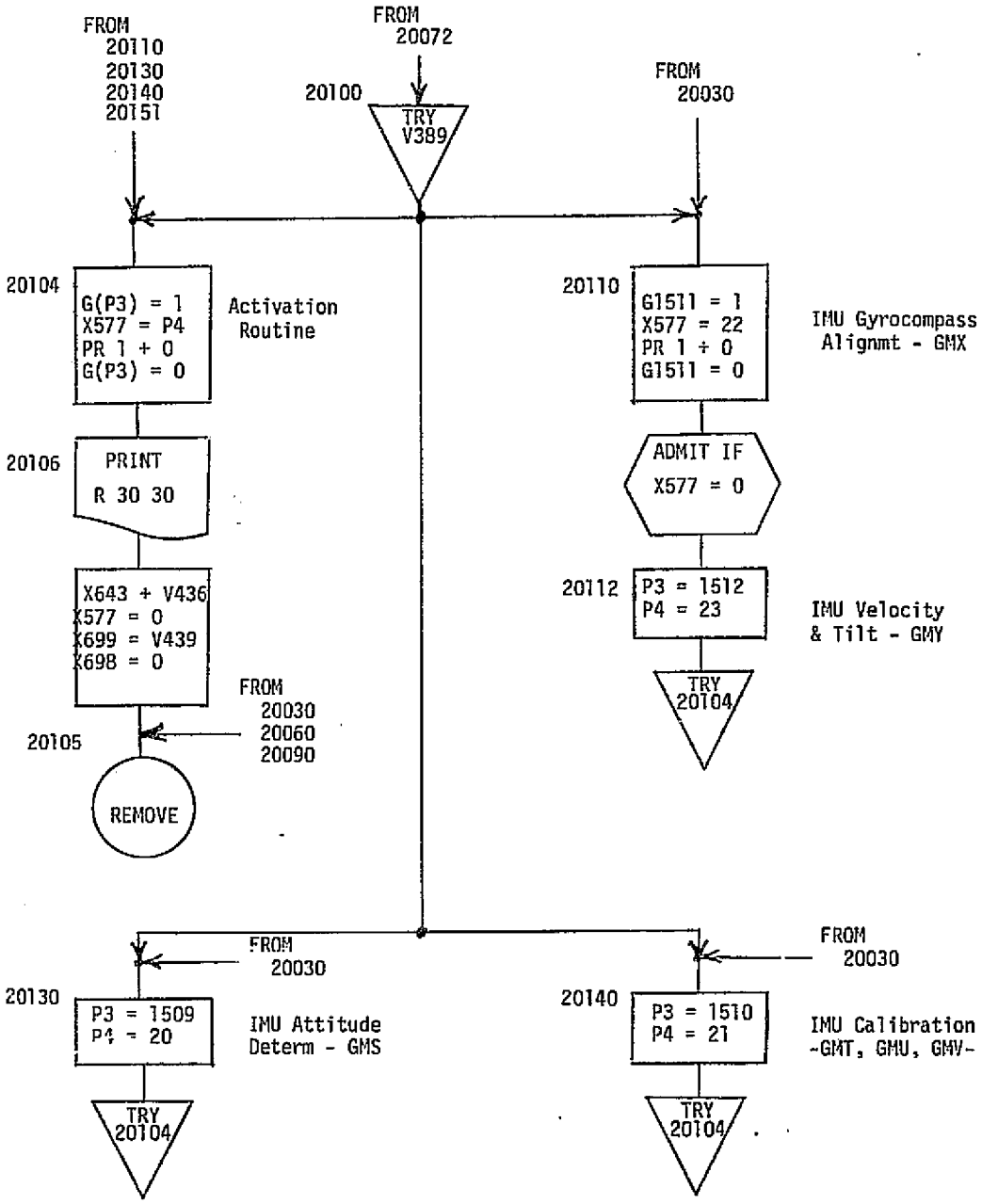

Figure 5-2 (cont)

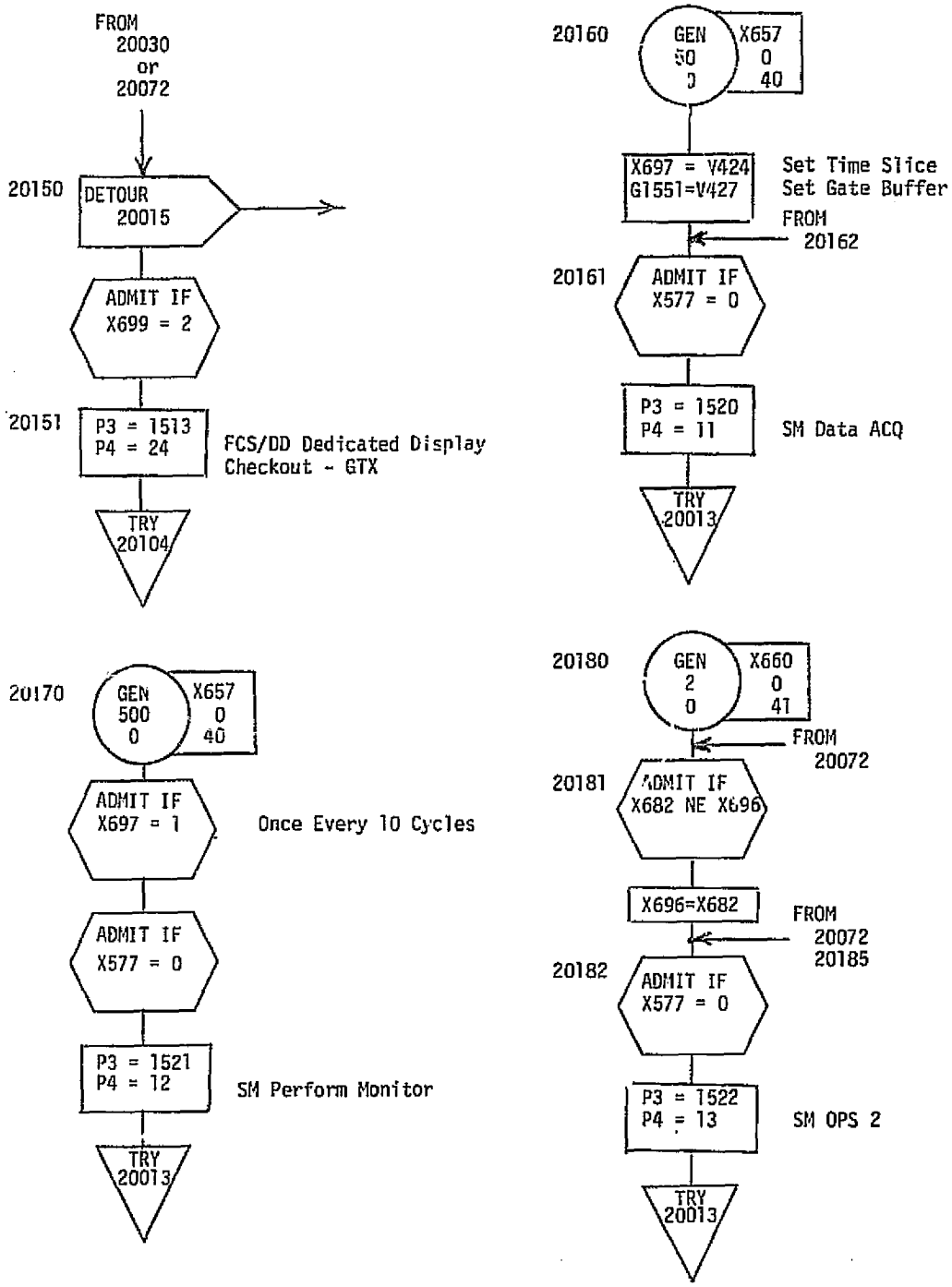

Figure 5-2 (cont)

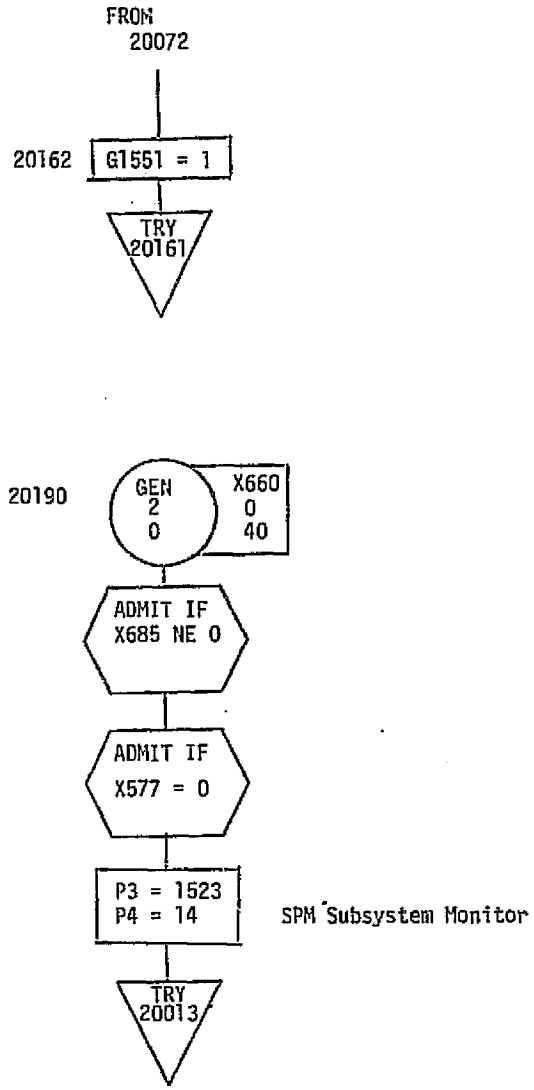

Figure 5-2 (cont)

5.2.4.1.2 Dynamic Setting of Conditions Through the Job Schedule. In order to enable dynamic setting of events during a simulated time period (e.g., manual actions taker by the Commander or Pilot, or request of Specialist Functions) IMSIM was modified to recognize this at the time specified in the job schedule. This was accomplished by adding a new form with a zero in the 2nd field, indicating this was an event occurrence. In this case, the next four fields on the line were interpreted respectively as a Savex Cell, incremental value, 2nd Savex Cell, and 2nd incremental value. The IMSIM Program Logic Manual (Reference 3) details the program blocks where the revision is inserted.

The code accomplishing this is as follows:

```
REVISE 238000 238000              ''SET SAVEX FROM JOBSCHEDULE
1010  DETOUR 1012
      ADMIT IF P2 = 0
      X(P3) + P4
      DETOUR 30012
      ADMIT IF PL1 GR 0
      SAVE P5
30010 X(P6) + P7
      POP
      POP
      DETOUR 30010
      ADMIT IF PL1 = 0
30012 REMOVE
1012  P2 = V153
```

5.2.4.1.3 Delivery of Computational Units by Routines. IMSIM was modified to calculate the computation time for a given function by summing the computational units assigned to each routine that is called by this function at a particular cycle. Thus, the routine will be the determining factor as to the amount of computation time it provides, dependent upon the conditions under which it is called to operate.

Calculation of the computation time for each routine is discussed in more detail in paragraph 5.2.4.2.

The code accomplishing this change is as follows:

```
REVISE 1134000 1134000            ''PREVENT COMP TIME FROM MESSAGES
      ADMIT IF X(P2) = 1
```

5.2.4.1.4 Suppression of Zero-Length Transmissions. This change was incorporated in IMSIM as a technical one to control the message transmission by its length, i.e., a zero-length transmission would prevent transmission or receipt.

The code for this change is as follows:

```
REVISE 881000 881000          ''SUPPRESS ZERO LENGTH TRANSMISSION
      DETOUR 1606
      ADMIT IF P3 = 0
      POP P2
      TRY 1865
1606  P2 = P6
```

5.2.4.1.5 Deletion of Segments of IMSIM. Certain segments of IMSIM, being a general purpose model, did not pertain to the simulation to be performed for NASA. These deletions were for Virtual Machine and Memory Recording, and to eliminate prototypes after they are initialized. These deletions avoided unnecessary scanning and calculations, that became a burdensome factor in the actual wall clock time for simulation runs.

The code for this change is as follows:

```
REVISE 39000 39000            ''SPEED-UP BY ELIMINATING PROTOTYPES
REVISE 649000 661000          '' SPEED-UP BY ELIMINATING V.M. & MEM.RECO
      TRY 1352
REVISE 663000 680000          ''SPEED-UP BY ELIMIN. V.M. & MEMORY RECORDING
      X(V67) = 1
```

5.2.4.1.6 Checkpoint Capability. This feature was incorporated in MODLIT/IMSIM to facilitate NASA simulation runs of longer duration, with a restart capability from previously established checkpoints.

5.2.4.1.7 New Reports. The following two new reports were incorporated in IMSIM to ease the reading of statistical outputs for cyclic functions performed during a simulation run.

```
REPORT 2 1 1
 DURING V232    SECONDS OF SIMULATED SHUTTLE OPERATIONS
 A TOTAL OF BW1160 DIFFERENT FUNCTIONS WERE INTRODUCED.
 THESE FUNCTIONS WERE ACTIVATED BW1166 TIMES, STATUS IS:
       BW1196 WERE COMPLETED
        B1167 ARE WAITING FOR NEXT ACTIVATION
        B3032 ARE IN READY STATE, I.E. WAITING FOR CPU
        B1182 ARE WAITING FOR MESSAGES TO COMPLETE
         V306 PRESENTLY EXECUTING, I.E. IN ACTIVE STATE
 FUNCTIONS WERE INTERRUPTED BW2000 TIMES.
  X643 FUNCTION ACTIVATIONS WERE ABORTED AS FUNCTION STILL ACTIVE. ENDR
REPORT 30 1 1 X577
 AT TIME     C1 ACTIVATION FOR FUNCTION X577 ABORTED, AS
 FUNCTION X577 IS STILL ACTIVE.  ENDR
```

The two reports for "Message Start" and Message End" were modified for easier reading and scanning in the simulation results.

The new format is reflected in the history printout of simulation runs in Appendix C.

5.2.4.2 Compute Times for Routines. Computational units in microseconds for routines pertaining to the Operating System or System Control were obtained from the ALT Functional Design Specification, Volume 2, Part 1 and Volume 2, Part 3. (Reference 19)

Computational units in microseconds for all other routines were determined by plotting all functions performed by each routine down to instruction level and applying the instruction execution times as given in IBM's Software System Notes #156-005 and IBM's CPU Instruction Execution Times Notes #C69-75-254 and #C69-75-256 (References 26, 27, and 28).

The conditions for operation of the routines (including flight conditions and states of the system) were then included for proper allocation of computing units, and were incorporated in "Variables" used by IMSIM to generate the computation time.

As IMSIM is based on millisecond time units, the computation times were given in fractions to 3 decimals for the proper microsecond presentation multiplied by a factor of 0.48 to compensate for the CPU processing speed factor so that the end result again would give the absolute calculated computation time for each routine.

Following is a discussion of the Variables developed for the routines to determine delivery of computation time. For clarity, the multiplication factor of 0.48 for all absolute computation times included to compensate for the CPU's speed factor), has been omitted from the discussion in this paragraph (see Section 5.1.3.4). The matrix values and makeup of all Variables are specified in detail in Appendix A).

a. If in the columns designated for computation time on form 3 a Variable 16 appears in column 1, then the succeeding value (X44) is the unconditional computation time whenever the routine is called for execution.

   Any value other than 16 indicates functional conditions which are expressed in that numbered variable.

b. Routine 31 (TAEM GUIDANCE) - Variable 359
   V359 = DFN (X700)(matrix values)

   The computation time of V359 is a discrete function of the 80 ms Time Slice Counter X700. This counter maintains the count of 80 ms cycles for 12 periods (960 ms). V359 is 0 for counter values between 0 and 5 and for a value of 7. V359 equals 0.03 ms for a counter value of 6 and 8 through 12. Computation time therefore varies between 0 and 30 μs.

c. Routine 42 (IMU Minor Cycle Executive) - Variable 355
   V355 = 1.55 + (RF1) * 0.3
   The computation time of the variable consists of a constant 1.55 ms and a random-generated time ranging between 0 and 0.3 ms. Computation for this variable is therefore between 1.55 and 1.85 ms.

d. Routine 45 (IMU Resolver Processing) - Variable 356
V356 = 0.72 + (RF1) * 0.11
Variable 356 has a computation time consisting of a constant 0.72 ms and a random-generated time ranging from 0 to 0.11 ms. Comp time for this routine therefore varies between 720 μs and 830 μs.

e. Routine 63 (IMU Velocity Tilt) - Variable 397
V397 = V398 + X44
V398 = DFN (X685)(matrix values)
The computation time of this variable is a discrete function of the Specialist function state. For a TERMINATE state V398 = 0.005 ms and for any other Specialist function state V398 = 0.135 ms. The fixed value of the routine 63 Savex cell X44 is 0.26 ms. The comp time of this variable therefore is between 265 and 395 μs.

f. Routine 134 (GPC/PCMMU Data Cycle Synchronizer) - Variable 364
V364 = 0.5 + (RF1) * 30 + X44
The computation time for this variable consists of a constant 0.5 ms plus a random-generated time of from 0 to 30 ms plus a computation time which is stored in Savex cell X44. The initial value of X44 is 0.215 ms. Comp time therefore varies between 715 μs and 30.715 ms.

g. Routine 135 (GPC Downlist Data Control Processor) - Variable 365
V365 = V362 + V356 + 0.66
V362 = 0.56 + (RF1) * 0.03 = Time for Routine 303
V356 = 0.72 + (RF1) * 0.11 = Time for Routine 45
The computation time for variable 365 consists of the computation time for routine 303, routine 45, and a constant of 0.66 ms. Comp time will therefore range between 1.94 and 2.08 ms.

h. Routine 155 (Systems Management Data Acquisition) - Variable 386
V386 = DFN (G1551)(
0.0024 0
0.096 1)
The computation time for this routine is a function of the setting of gate 1551, which is the processing gate for data acquisition. This gate is set every 50 ms by Variable 427, which is a function of the value produced by a random-number generator. If the gate is set, processing time will be 200 microseconds, if the gate is not set, comp time drops to 5 microseconds.

i. Routine 301 (Flight Control) = Variable 350
V350 = 0.98 + V351 + V352
V351 = DFN (X683, X684)(matrix values)
V352 = FDN (X681, X682)(matrix values)
X683 = Navigational Status Savex
X684 = Flight Condition Savex
X681 = Time Slice Savex
X682 = Major Mode Savex

This variable consists of a fixed time of 0.98 ms plus two additional times which are discrete functions of system conditions. The time for Variable V351 is a function of Navigational state and flight conditions and can range from 0 to 0.615 ms. The time for Variable V352 is a function of the processing time-slice period and the major mode and has a range from 0.31 to 5.875 ms.

The computation time for this routine therefore is 1.29 ms minimum to 7.47 ms maximum.

j. Routine 302 (Mated/Drop Control) - Variable 361

V361 = V(V360)
V360 = DFN (V366, V367) (matrix values)
V366 = X681'2 80 ms Time slice
V367 = X684'2 Platform Release

The computation time for V361 is a variable whose identification number is defined by V360. For the conditions where the time slice is not 80 ms and the IMU platform has not been released or where the time slice is 80 ms and the IMU platform has been released, V360 = V365. For the condition where the time slice is not 80 ms but the IMU platform has been released, V360 = V363=0.

V365 = V362 + V356 + 0.66
V362 = 0.58 + (RF1) * 0.03
V356 = 0.72 + (RF1) * 0.11

For the condition where V360 = V363, the computation time of V361 will be zero.

For the condition where V360 = V365, the computation time for V361 will be determined by two randomly generated values plus a constant. For this condition, the computation time will vary between 1.96 ms. and 2.10 ms.

k. Routine 303 (IMU Processing, Accelerometer Accumulator and Gyro Torquing) - Variable 362.

V362 = 0.56 + (RF1) * 0.03

The computation time of this variable is randomly generated and will range from 0.56 ms to 0.59 ms.

l. Routine 304 (Displays and IMU Moding) - Variable 390

V390 = 0.09 + V391
V391 = 0.01 + X687 * V392
V392 = DFN (X685, X682)(matrix values)

The value of V392 is a discrete function of the Major mode and the status of the Specialist Function. However, the value of V392 can only be used if DISPLAY status is in the "New Display" condition. Depending on the conditions of the Major mode, the Specialist function and Display conditions, V390 will have a range of 100 μs to 485 μs.

m. Routine 306 (Navigation) - Variable 368
V368 = X44 + 369
V369 = DFN (X682)(matrix values)
Computation time for V368 consists of a fixed value of 150 μs (stored in Savex cell X44) and a value which is a discrete function of the Major operational mode. The times for V369 are as follows:

- 0.3 ms for Null and Preflight Prep Modes
- 0.34 ms for Mated Idle, Mated Flight, Separation, Postseparation and TAEM Modes
- 0.16 ms for the Approach & Landing Mode
- 0.34 ms for the Rollout mode.

Computation time will therefore range between 490 ms and 310 ms.

n. Routine 307 (Guidance) - Variable 370
V370 = V(379)
V379 = DFN (X682)(matrix values)
The computation times for this variable are defined by a variable which is selected by the conditions of V379. When the major mode is Null, Preflight Prop, Mated Idle, Mated Flight, Presep or Postsep, V379 = V363. When the major mode is TAEM, Approach & Landing or Rollout, V379 = V393.

V363 = 0
V393 = DFN (X688)(matrix values)
Savex Cell X688 contains Flight Path Conditions. For trajectory capture and steep glide slope conditions, V393 = 0.09 ms. For a shallow glide slope condition, V393 = 0.12 ms, and for the final flare condition, V393 = 0.08 ms.

The computation time for V370 is thus a function of major mode and flight path conditional states, and ranges between 0. and 120 μs.

o. Routine 308 (TAEM Navigation) - Variable 357
V357 = 1.9 + V358
V358 = DFN (X682)(matrix values)
The computation time of this variable is a constant of 1.9 ms plus a variable time which is a discrete function of the state of the Major Mode. For the Null, Preflight Prep, and Mated Idle states the variable time is 1.05 ms. For all other major mode states the variable time is 0.75 ms. Computation time for this routine is therefore between 2.65 ms and 3.95 ms.

p. Routine 309 (IMU Major Functions) - Variable 353
V353 = DFN (X682)(matrix values)
The computation time for Variable V353, is a discrete function of the state of the Major Mode. For NULL and Preflight Prep the computation time is 6.0 ms. For all other major modes the computation time is 5.3 ms.

q. Routine 310 (IMU Attitude and Nav-Base to Cluster Transformation) - Variable 354
V354 = DFN (V366, X682)(matrix values)
V366 = X681'2 = 80 ms time slice
The computation time of variable 354 is a discrete function of the 80 ms processing time slice and the Major Mode condition. Minimum time is 0.85 ms and occurs when the major mode is any mode other than NULL or Preflight Prep and the computation is within an 80 ms time cycle. The maximum time is 2.5 ms and occurs when the Major Mode is either NULL or Preflight Prep and the computation is not within an 80 ms time cycle.

r. Routine 312 (Redundancy Management) - Variable 428
V428 = V394 * 0.48
V394 = DFN (X700)(Matrix Values)
Savex Cell X700 is the 80 ms time slice counter which maintains a sequential count of the number of 80 ms time slices for each 960 ms time span. V394 will have a specific computation time depending on the time slice counter. These values are:

Value of Time Slice Counter	Value of V394
1	0.25 ms
2	0.075 ms
3	0.116 ms
4	0.316 ms
5	0.105 ms
6	0.098 ms
7	0.238 ms
8	0.129 ms
9	0.128 ms
10	0.220 ms
11	0.093 ms
12	0.154 ms

Therefore, this variable will have a computation time ranging from 75 μs to 316 μs.

s. Routine 315 (Mated Drop, Warm Up, and Raw Data Processing) - Variable 396
V396 = 5.986 + V367 * (V362 + V395 + 0.125) + V390
V362 = Computation Time for Routine 303
V367 = Platform Release
V390 = Computation Time for Routine 304
V395 = DFN (X682)(matrix values)
The value of variable 395 is a discrete function of the Major Mode For all modes except Approach & Landing, and Roll Out, V395 = 0.15 ms. For the latter two modes, V395 = 85 μs. The value of V362 will range from 0.56 to 0.59 ms (see sub "k"). The use of the times defined by V362 and V395 for V396 is dependent on the platform release condition. These variables are a part of the computation time if the platform is in a

released condition. The value of V390 will range from 0.1 ms to 0.485 ms (see sub "1"). From the above values, V396 will have a range between 6.086 ms and 7.336 ms.

t. Routine 316 (Systems Management Performance Monitoring) - Variable 425
V425 = DFN (X685)(matrix values)
The computation time for this routine is a function of the Keyboard & Applications Control Savex setting. Normal computation time is 130 microseconds, but when Specialist Key Special Computations is requested, the computation time increases to 320 μsec.

5.2.4.3 Variables. The Variables for the computation time of routines were discussed in the previous paragraphs.

The other variables used in this model for the ALT Space Shuttle simulation are for the following areas:

a. System Conditions

b. Sinks or Sources for Messages

c. Time Setting and Generation

d. Task Branching

e. Go/No-Go Setting

f. Access Time for Mass Memory

g. Memory determination for each of four Virtual Machines

They are discussed below in the same order.

5.2.4.3.1 System Conditions.

a. Platform Release - Variable 367.
V367= X684'2
This variable tests the value of Savex Cell X684 to determine, through remainder division by 2, if the last bit of the value is a "1" or a "0". When the last bit is a "1", it indicates that the IMU platform is released.

b. Condition for Routine GMA Operation - Variable 378
V378 = DFN (X682, V367) (matrix values)
X682 is the Major Mode Savex Cell
V367 is the Platform Release variable.
This variable sets the condition that the routine GMA will operate only when the Major Mode is MATED-IDLE and the IMU platform has not been released.

5.2.4.3.2 Message Sources and Sinks.

a. Sinks for FF messages.
The FF MDMs are Device numbers: 6009, 60010, 60011, and 60012. Message transmissions are sent to these devices by Variable 380.
V380 = P8 + 60008
P8 = Number of transmissions remaining for a message.
60008 = Device number used as an index for determining the device identification to which transmissions are to be sent.

b. Sinks for FA Messages
FA MDM Device numbers are: 60013, 60014, 60015, and 60016. Message transmissions are sent to these devices by Variable 381.
V381 = P8 + 60012

c. Sinks for DDU Messages.
The device numbers of the DDU units are: 60017, 60018, and 60019. Message transmissions are sent to these units via Variable 382.
V382 = P8 + 60016

d. Sinks for ICC Messages
ICC message Sinks will be GPC memory units which are identified in the model by the numbers 70001, 70002, 70003, and 70004. Messages to these units are sent via Variable 384.
V384 = P8 + 70001

e. Sources for ICC Messages
The memory units 70001, 70002, 70003, and 70004 are both the source and sink for ICC messages. To control the source of these message transmission, the Variable 383 is used.
V383 = P7 + 70001
P7 is the number of transmissions remaining for a message to be used for determining transmission sources.

5.2.4.3.3 Time Settings and Time Generation.

a. Set Time for Savex 681. - Variable 371.
V371 = V375 + V376
V375 = DFN (V372, V373) (matrix values)
V376 = DFN (V374) (matrix values)
V372 = CT'80
V373 = CT'320
V374 = CT'2000
Savex 681 indicates the processing time slice. Values for time slices of 40, 80, 160, 320, 1000, and 2000 are generated by performing remainder division of clock time (V372, V373, and V374) and by defining logical bit settings (V375 and V376) for the results, followed by combination of these results.

b. 80 MS Time Slice
For some model routines a simple indicator of the presence or absence of the 80 ms time is required. This is accomplished via Variable 367.

```
V367 = X681'2
```

Upon performing remainder division by 2, a result of 1 indicates an 80 ms time slice.

5.2.4.3.4 Task Branching.

a. Branching conditions for the User Interface Function - DMC. Branching to internal IMSIM locations is a function of the setting of Savex 685 (Keyboard and Application Control) and is defined by Variable 388 as follows:

```
V388 = DFN (X685)(
     20090     1
     20100     2
     20150     3
     20162     4
     20181     5
     20015     6)
```

b. Branching conditions for GUG tasks (Display Checkout Control) are required for numerical keyboard inputs. These branches to internal IMSIM locations are defined by Variable 389 as follows:

```
V389 = DFN (X699)(
     20104     0
     20110    10
     20104    11
     20130    12
     20140    13
     20104    16)
```

5.2.4.3.5 Go/NoGo Settings. Model variables V401 through V418 and V420 through V423 are used to establish Go or NoGo conditions for tasks. In all cases, this condition is accomplished via a corresponding IMSIM GATE.

Listed below are the Go/NoGo variables used in the model:

V401 = G1501	V409 = G1509	V417 = G1517
V402 = G1502	V410 = G1510	V418 = G1518
V403 = G1503	V411 = G1511	V420 = G1520
V404 = G1504	V412 = G1512	V421 = G1521
V405 = G1505	V413 = G1513	V422 = G1522
V406 = G1506	V414 = G1514	V423 = G1523
V407 = G1507	V415 = G1515	
V408 = G1508	V416 = G1516	

5.2.4.3.6 Mass Memory Access Time. Mass Memory access time is specified as having a range of 500 ms to 8000 ms. This condition is simulated by Variable 399.

V399 = X44 + V400
V400 = CFN (RFT) (Matrix Values)
X44 is a Savex constant of 500 ms.
V400 is a randomly generated value having a range of 0 to 7500 ms.

5.2.4.3.7 Memory Determination for each of the four Virtual Machines.

a. Variable 422 is used for the memory definition of each of the tasks. It is a function of the job, and the appropriate tasks are initiated in each of the four GPCs.
V442 = X(V29) + 69999.

b. Memory Determination for ICC messages. Variable 384 is used for the memory determination of the ICC messages generated by each of the four GPCs. It is a function of the job number in each GPC.

```
V384 = DFN (X(V29))(
   70002        2
   70003        3
   70004        4
   70001        5)
```

5.2.4.4 Savex Cells and Gates

5.2.4.4.1 Savex Cell Utilization. A group of Savex Cells has been designated and used for NASA-Unique conditional requirements, systems conditions, counters, and miscellaneous functions.

The utilization of these Savex Cells and the values associated with their use follows:

X638 - START TIME FOR UTILIZATION REPORTS

X639 - LIGHT ALARM
00 = NO LIGHT ALARM
01 = LIGHT ALARM EVENT

X640 - TIME MGT
00 = NOT ENABLED
01 = TIME MANAGEMENT ENABLED

X641 - DOWNLIST
00 = NOT ENABLED
01 = DOWNLIST ENABLED

X642 - 40 MS TIME SLICE COUNTER

X643 - FUNCTION ABORT COUNTER

X656 - START TIME GROUP 1 FUNCTIONS (40 & 80 MS)

X657 - START TIME GROUP 2 FUNCTIONS (50, 100, 200 & 500 MS)

X658 - START TIME GROUP 3 FUNCTIONS (320 MS)

X659 - START TIME GROUP 4 FUNCTIONS (1000 & 2000 MS)

X660 - START TIME GROUP 5 FUNCTIONS (2 MS)

X681 - TIME SLICE PROCESSING:
00000 = 40 MS
00001 = 80 MS
00010 = 160 MS
00100 = 320 MS
01000 = 1000 MS
10000 = 2000 MS

X682 - MAJOR MODES GN&C:
00 = NULL
01 = PREFLIGHT PREP
10 = MATED IDLE
11 = MATED FLIGHT
12 = SEPARATION PRESEP
13 = SEPARATION POSTSEP
14 = TAEM
15 = APPROACH & LANDING
16 = ROLLOUT

X683 -	NAVIGATIONAL STATES:	01 = AUTO-P	
		02 = AUTO-RY	
		03 = AUTO-BF	
		11 = CAS-P	
		12 = CAS-RY	
		13 = CAS-BF	
		21 = MD-P	
		22 = MD-RY	
		23 = MD-BF	
X684 -	FLIGHT CONDITIONS:	00000 =	
		00001 = IMU PLATFORM RELEASED	
		00010 = NWSE	
		00100 = WONG	
		01000 = WOWLON	
		10000 = FLAT TURN	
X685 -	KEYBRD & APPLICAT. CONTROL:	01 = TERMINATE	SPEC KEY
		02 = IMU OPERATIONS	SPEC KEY
		03 = FCS/DED.DISPL C.O	SPEC KEY
		04 = SPECIAL COMPUT	SPEC KEY
		05 = MODE CHANGE	OPS KEY
		06 = CLEAR	NO SIM
		07 = FAULT	NO SIM
		08 = RESUME	SIM
		09 = EXECUTE	SIM
		10 = PRO	SIM
		11 = ITEM	SIM
		12 = ACK	NO SIM
		13 = MSG RESET	NO SIM
		14 = RETURN	NO SUPPORT
		15 = CMPTR/CRT	NO SIM
		16 = CMPTR/BUS	NO SIM
		19 = DISPLAY	SIM
		20 = ENTER	NO SIM
		21 = TRANSFER	NO SUPPORT
X687 -	DISPLAY	00 = DISPLAY UPDATE	
		01 = NEW DISPLAY	
X688 -	A & L STATES:	01 = TRAJECTORY CAPTURE	
		02 = STEEP GLIDE SLOPE	
		03 = SHALLOW GLIDE SLOPE	
		04 = FINAL FLARE	

X689 - MAJOR MODES SM :
00 = IDLE
01 = SYSTEM MONITOR
02 = PRE TAKE OFF
03 = SYSTEM MONITOR
04 = PRE DROP
05 = SYSTEM MONITOR

X695 - CURRENT MAJOR MODE SM

X696 - CURRENT MAJOR MODE GN&C

X697 - 50 MS TIME SLICE COUNTER : 1 - 10

X698 - TERMINATE INDICATOR:
00 = NO TERMINATE ACTION
01 = TERMINATE ACTION TAKEN

X699 - NUMERICAL KEYBOARD INPUTS : 1 - 99

X700 - 80 MS TIME SLICE COUNTER : 1 - 12

5.2.4.4.2 Gate Utilization. Gates 1501 through 1523 have been used as communication gates between the generated transactions and the prototype tasks to activate the proper tasks at the proper intervals. A gate setting of "1" will activate, whereas a setting of "0" specifies a "No-Go" condition. Gate 1551 has been used as the processing gate for S.M. data acquisition processing. A "1" setting provides processing. Gate 1552 has been used for a "Terminate" action for the various functions. Setting of this gate to "1" presents a "Terminate" condition for designated task.

5.2.4.5 Parameterization. The model has been parameterized with the parameters listed in Appendix B under NASA.SPECS10.DATA (for one Virtual Machine with four GPCs) and under NASA.SPECS20.DATA (for simulation with four Virtual Machines).

5.2.5 Model Execution (S.O.W. 2.1.5)

This section describes the work performed under task 2.1.5 as defined in the Statement of Work (Exhibit "A") of the contract.

a. A battery of simulation runs was executed. The first set of runs was geared towards overall loading of the model and the cyclic execution of all its tasks. The runs went through the major phases of flight. Details of these simulation run executions are found in paragraph 5.2.5.1.

b. The second set of runs was concentrated on peak loads developing during flight. Based on the cyclic nature of the software functions and the intervals between function executions, peak loading will occur every 16 seconds when all cyclic functions culminate and compete for the CPU, and every four seconds, when all but the 320 ms functions are activated. Details of these simulation run executions are found in paragraph 5.2.5.2

c. A third set of runs was based on certain flight segments to determine if any bottlenecks would develop in any segment. Details of these simulation run executions are found in paragraph 5.2.5.3.

d. A fourth set of runs was based on four separate Virtual Machines, with each GPC depicting one Virtual Machine. Details of these simulation run executions are found in paragraph 5.2.5.4. Software variations were made in the second, third, and fourth set of simulation runs, when the new operational System Logic as specified in the ALT Detailed Design Specification for FCOS, User Interface, and System Control was incorporated in the model specifications.

   Hardware variations were based on the concepts of one Virtual Machine with the four GPCs operating in the redundant mode, versus four Virtual Machines each with one GPC. These variations were exercised within the second set and the fourth set of executed simulation runs.

In order to facilitate simulated situations that create peak loads, the start times of the cyclic functions were controlled in some sets of runs by the setting of Savex Cells 656 through 660 as indicated in Table 5-2. The functions were grouped together by cyclic intervals as follows:

Table 5-2. Function Grouping for Start Times

Group	Savex	Tasks	No.	Time Interval
A = 1	656	GEF	6	40
		AIE	7	40
		GAD	8	40
		GMA	9	40
		GEM	10	80
B = 2	657	SDM DA	11	50
		DCI	35	100
		DMI	32	200
		SDM PM	12	500
C = 3	658	GMG	19	320
D = 4	659	ARA	37	1000
		GEN	15	2000
E = 5	660	GTX	24	2
		GMX	22	2
		GMY	23	2
		GMT/U/V	21	2
		GMS	20	2
		DMC	34	2
		SM OPS2	13	2
		SPM	14	2

The results of the model execution through the four sets of simulation runs are discussed in Section 2 - Results, Section 3 - Conclusions, and Section 5.2.6 - Test Analysis.

5.2.5.1 Initial Set of Simulation Runs. The first part of this set of runs was to validate the model. After the validation runs that exercised all modeled software and hardware, a time line, hereafter called a 'jobschedule' was developed that encompassed all major modes of flight, and started the second part of this set. The start time for the job was specified at 20 ms, at which time the IMSIM executive has completed its initiation cycle.

Specialist functions were fed in through the jobschedule at various subsequent times.

This jobschedule is given in Table 5.3. The first column in the table indicates the time (in milliseconds) at which the job or event is introduced to the system.

The second column specifies the job to be initiated. A zero in this column indicates that the next four fields are events to be set in Savex Cells (column 3 = Savex Cell number, column 4 = value to be set in this Savex, column 5 = 2nd Savex Cell number (if any), column 6 = value to be set in this 2nd Savex, if applicable).

Table 5.3. Jobschedule JSCA02

```
''JOBSCHEDULE --  JSCA02
''
  20     2
  20     0     682      1      ''Preflight
 150     0     685      3      ''Display Checkout
 150     0     699      2      ''      -do.-
1000     0     682      9      ''Mated Idle
1200     0     684      1      ''IMU Released
1500     0     682      1      ''Mated Flight
1800     0     682      1      ''Presep
1900     0     683      2      ''AUTO-RY
2100     0     682      1      ''Postsep
2200     0     685      2      ''IMU Ops
2201     0     699     10      ''IMU Alignment
2300     0     685      2      ''IMU Ops
2301     0     699     12      ''IMU Attitude
2400     0     683     10      ''CAS-RY
3000     0     682      1      ''TAEM
3200     0     683     11      ''MD-BF
3250     0     682      1      ''Approach & Landing
3300     0     684  10000      ''Flat turn
3350     0     688      1      ''Trajectory capture
3400     0     688      1      ''Steep glide slope
3450     0     688      1      ''Shallow glide slope
3500     0     688      1      ''Final flare
```

Table 5-3 presents a time-sequenced list of this workload schedule. The job for the ALT Configuration of the Space Shuttle will start at time 20 (ms). At the same time, the Major Mode is set to "Preflight" by means of setting Savex Cell X682 to 1. At 150 ms the Display Checkout Specialist Function is selected by means of setting Savex Cell X685 to 3 and Savex Cell X699 to 2.

At 1 sec (1000 ms), the Major Mode is changed to "Mated Idle" by increasing X682 by 9. 200 ms later, the IMU Release is simulated (controlled by X584). At time 1500, the Major Mode changes to "Mated Flight" and at time 1800, to "Preseparation". The Navigational State is set to AUTO-RY at time 1900 by means of X683 and at time 2100, the "Postseparation" mode is entered. At time 2200 the IMU ops "IMU Alignment" is activated (X685 = 2 and X699 = 10), while 100 ms later the IMU ops "IMU Attitude" (X685 = 2, X699 = 12) is simulated. At time 2400, the Navigation State is changed to CAS-RY (X683 = 12). A change to Major Mode "TAEM" is activated at time 3000. During the last 500 ms, the Major Mode is changed to "Approach Landing". The Navigational State is changed, and the Trajectory Capture and Glide Slope is simulated.

In running with this jobschedule, it became apparent that between time 150 ms and 1000 ms, only the routine cyclic functions executed repeatedly without change in state. For analysis purposes, this was of little value. A more compacted time-line sequence of workload was constructed, thereby avoiding long segments of routine cyclic operations. This jobschedule then became the standard schedule used for the other runs in the previously defined first set of executed simulation runs (Table 5-4).

Table 5-4. Compacted Jobschedule JSCA03

''JOBSCHEDULE		JSCA03		
20	2			
25	0	682	1	''PREFLIGHT
100	0	685	3	''DISPLAY CHECKOUT
100	0	699	2	'' -DO.
150	0	682	9	''MATED IDLE
200	0	684	1	''IMU RELEASED
250	0	682	1	''MATED FLIGHT
450	0	682	1	''PRESEP
500	0	683	2	''AUTO-RY
550	0	682	1	'' OSTSEP
600	0	685	2	''IMU OPS
601	0	699	10	''IMU ALIGNMENT
650	0	685	2	''IMU OPS
651	0	699	12	''IMU ATTITUDE
700	0	683	10	''CAS-RY
750	0	682	1	''TAEM
800	0	683	11	''MD-BF
850	0	682	1	''APPROACH & LANDING
900	0	684	10000	''FLAT TURN
950	0	688	1	''TRAJECTORY CAPTURE
1000	0	688	1	''STEEP GLIDE SLOPE
1050	0	688	1	''SHALLOW GLIDE SLOPE
1100	0	688	1	''FINAL FLARE
1200	0	682	1	''ROLLOUT
1250	0	682	-6	''IDLE MODE

5.2.5.2 Concentrated Segment Runs. Simulation runs executed in this set were based on the theory that due to the cyclic nature of part of the Shuttle's functions, and the intervals between the cyclic execution of these functions, peak loads were developed at certain times.

Based on intervals of 40 ms, 50 ms, 80 ms, 100 ms, 200 ms, 320 ms, 500 ms, 1000 ms, and 2000 ms, this would occur at 4-second and 16-second intervals, when all cyclic functions would compete for usage of the CPU.

A timeline was developed that would simulate this situation. The jobschedule for this set of runs is given in Table 5-5. Flight state and conditions were preset at the start of these runs.

Table 5-5. Concentrated Jobschedule JSCA05

```
''JOBSCHEDULE --          JSCA05
''
71095   2                              ''JOB START
72010   0    685    3    699   2      ''FCS DISPLAYS
72050   0    685    5    683   1      ''AUTO-RY
72075   0    685    2    699  10      ''IMU OPS - ALIGNMENT
72125   0    685    5    689   1      ''PREDROP MODE SM
72160   0    685   10    683  10      ''CAS-RY
72200   0    685    2    699  13      ''IMU OPS - CALIBRATION
72240   0    685    5    682   2      ''TAEM MODE GN&C
72265   0    685    5    689   1      ''SYSTEM MONITOR MODE SM
72290   0    685    5    683  -1      ''CAS-P
72340   0    685    5    683  12      ''MD-BF
72350   0    685   19    687   1      ''INIT. AUTO-LAND DISPLAY
72375   0    685    5    682   1      ''APPROACH & LANDING MODE GN&C
72390   0    685   10    683  -2      ''MD-P
72410   0    684    10000             ''FLAT TURN
72450   0    687       -1             ''END AUTO-LAND DISPLAY
72500   0    684   -10000             ''END FLAT TURN
72510   0    688        1             ''TRAJECTORY CAPTURE
72550   0    688        1             ''STEEP GLIDE SLOPE
72575   0    687        1             ''FIRST FLARE DISPLAY
72650   0    688        1             ''SHALLOW GLIDE SLOPE
72675   0    687       -1             ''END FIRST FLARE DISPLAY
72680   0    687        1             ''PULL UP & FLARE DISPLAY
72700   0    688        1             ''FINAL FLARE
72750   0    684     1000             ''WOWLON
72800   0    684      100             ''WONG
72805   0    685    5    683 -18      ''AUTO-BF
72875   0    685    5    682  -5      ''IDLE MODE GN&C
72900   0    685    5    689  -5      ''IDLE MODE SM
N
```

The preset conditions for this jobschedule were:

```
S X638 = 72000              ''START TIME FOR UTILIZATION REPORT
S X640 = 1                  ''TIME MGT ENABLED
S X641 = 1                  ''DOWNLIST ENABLED
S X656 = 72000          ''START TIME GROUP 1 TASKS
S X657 = 72000          ''START TIME GROUP 2 TASKS
S X658 = /2000          ''START TIME GROUP 3 TASKS
S X659 = 72000          ''START TIME GROUP 4 TASKS
S X660 = 72000          ''START TIME GROUP 5 TASKS
S X682 = 12         ''PRESEP GN&C MODE
S X683 = 1          ''AUTO-P
S X684 = 1          ''IMU RELEASED
S X689 = 3          ''SYSTEM MONITOR SM MODE
S X695 = 3          ''PRESENT SM MODE
S X696 = 12         ''PRESENT GN&C MODE
```

One Specialist Function that was simulated at time 72200, viz. IMU calibration, in all probability would not be done in flight. Therefore, this jobschedule was changed to JSCA06 replacing this Specialist Function.

The new jobschedule JSCA06 is shown in Table 5-6.

Table 5-6. Concentrated Jobschedule JSCA06

```
''JOBSCHEDULE  --  JSCA06
''
71095   2                                   ''JOB START
72010   0    685   3    699   2            ''FCS DISPLAYS
72050   0    685   5    683   1            ''AUTO-RY
72075   0    685   2    699  10            ''IMU OPS - ALIGNMENT
72125   0    685   5    689   1            ''PREDROP MODE SM
72160   0    685  10    683  10            ''CAS-RY
72200   0    685   2    699  12            ''IMU OPS - ATTITUDE
72240   0    685   5    682   2            ''TAEM MODE GN&C
72265   0    685   5    689   1            ''SYSTEM MONITOR MODE SM
72290   0    685   5    683  -1            ''CAS-P
72340   0    685   5    683  12            ''MD-BF
72350   0    685  19    687   1            ''INIT. AUTO-LAND DISPLAY
72375   0    685   5    682   1            ''APPROACH & LANDING MODE GN&C
72390   0    685  10    683  -2            ''MD-P
72410   0    684    10000                  ''FLAT TURN
72450   0    687       -1                  ''END AUTO-LAND DISPLAY
72500   0    684   -10000                  ''END FLAT TURN
72510   0    688        1                  ''TRAJECTORY CAPTURE
72550   0    688        1                  ''STEEP GLIDE SLOPE
72575   0    687        1                  ''FIRST FLARE DISPLAY
72650   0    688        1                  ''SHALLOW GLIDE SLOPE
72675   0    687       -1                  ''END FIRST FLARE DISPLAY
72680   0    687        1                  ''PULL UP & FLARE DISPLAY
72700   0    688        1                  ''FINAL FLARE
72750   0    684     1000                  ''WOWLON
72800   0    684      100                  ''WONG
72805   0    685   5    683 -18            ''AUTO-BF
72875   0    685   5    682  -5            ''IDLE MODE GN&C
72900   0    685   5    689  -5            ''IDLE MODE SM
N
```

This jobschedule became the standard schedule for execution control in this set of tests.

Preset conditions for these runs were:

```
S X638 = 72000              ''START TIME FOR UTILIZATION REPORT
S X640 = 1                  ''TIME MGT ENABLED
S X641 = 1                  ''DOWNLIST ENABLED
S X656 = 72000          ''START TIME GROUP 1 TASKS
S X657 = 72000          ''START TIME GROUP 2 TASKS
S X658 = 72000          ''START TIME GROUP 3 TASKS
S X659 = 72245          ''START TIME GROUP 4 TASKS
S X660 = 72000          ''START TIME GROUP 5 TASKS
S X682 = 12         ''PRESEP GN&C MODE
S X683 =  1         ''AUTO-P
S X684 =  1         ''IMU RELEASED
S X689 =  3         ''SYSTEM MONITOR SM MODE
S X695 =  3         ''PRESENT SM MODE
S X696 =  12        ''PRESENT GN&C MODE
```

The jobschedule in Table 5-6 was also the basis for the variations in hardware from one Virtual Machine to four Virtual Machines.

5.2.5.3 ALT Flight Segment Runs. In addition to the runs described in paragraphs 5.2.5.1 and 5.2.5.2, jobschedules were developed for running particular flight segments. A timeline for this purpose is given in Table 5-7.

Table 5-7. Jobschedule JSCA07 for Flight Segments

```
''JOBSCHEDULE  --  JSCA07
31095   2                                ''JOB START
32010   0    685    3    699   2        ''FCS DISPLAYS
32050   0    685    5    683   1        ''AUTO-RY
32075   0    685    2    699   10       ''IMU OPS - ALIGNMENT
32125   0    685    5    689   1        ''PREDROP MODE SM
32160   0    685   10    683   10       ''CAS-RY
32200   0    685    2    699   12       ''IMU OPS - ATTITUDE
32240   0    685    5    682   1        ''SEP. MODE
32350   0    685    5    68?   1        ''POST SEP.
32375   0    685    5    683  -1        ''CAS-P
32400   0    685    5    689   1        ''SYSTEM MONITOR MODE SM
32450   0    685    5    683   12       ''MD-BF
32600   0    685    5    689   1        ''TAEM
N
```

Preset conditions for these runs were:

```
S X640 = 1                    ''TIME MGT ENABLED
S X641 = 1                    ''DOWNLIST ENABLED
S X656 = 32000              ''START TIME GROUP 1 TASKS
S X657 = 32000              ''START TIME GROUP 2 TASKS
S X658 = 32000              ''START TIME GROUP 3 TASKS
S X659 = 32245              ''START TIME GROUP 4 TASKS
S X660 = 32000              ''START TIME GROUP 5 TASKS
S X682 = 11                 ''MATED FLIGHT

S X683 = 1           ''AUTO-P
S X684 = 1           ''IMU RELEASED
S X689 = 3           ''SYSTEM MONITOR SM MODE
S X695 = 3           ''PRESENT SM MODE
S X696 = 11          ''PRESENT GN&C MODE
```

5.2.5.4 Multiple Virtual Machine Runs. A set of simulation runs was executed in which each GPC was simulated as a separate virtual machine. All GPCs are active, but only one performs the actual message transmission to MDMs. All four virtual machines transmit and receive ICC messages. Specification File NASA.SPECS20.DATA was used for these runs.

The jobschedule developed for these runs is given in Table 5-8, with each Virtual Machine assigned its own job.

Table 5-8. Jobschedule JSCA08 for Four Virtual Machines.

```
''JOBSCHEDULE  --  JSCA08
''
71995   2                                   ''JOB START FOR VM 1
71995   3                                   ''JOB START FOR VM 2
71995   4                                   ''JOB START FOR VM 3
71995   5                                   ''JOB START FOR VM 4
72010   0    685   3   699   2    ''FCS DISPLAYS
72050   0    685   5   683   1    ''AUTO-RY
72075   0    685   2   699  10    ''IMU OPS - ALIGNMENT
72125   0    685   5   689   1    ''PREDROP MODE SM
72160   0    685  10   683  10    ''CAS-RY
72200   0    685   2   699  12    ''IMU OPS - ATTITUDE
72240   0    685   5   682   2    ''TAEM MODE GN&C
72265   0    685   5   689   1    ''SYSTEM MONITOR MODE SM
72290   0    685   5   683  -1    ''CAS-P
72340   0    685   5   683  12    ''MD-BF
72350   0    685  19   687   1    ''INIT. AUTO-LAND DISPLAY
72375   0    685   5   682   1    ''APPROACH & LANDING MODE GN&C
72390   0    685  10   683  -2    ''MD-P
72410   0    684    10000         ''FLAT TURN
72450   0    687       -1         ''END AUTO-LAND DISPLAY
72500   0    684   -10000         ''END FLAT TURN
72510   0    688        1         ''TRAJECTORY CAPTURE
72550   0    688        1         ''STEEP GLIDE SLOPE
72575   0    687        1         ''FIRST FLARE DISPLAY
72650   0    688        1         ''SHALLOW GLIDE SLOPE
72675   0    687       -1         ''END FIRST FLARE DISPLAY
72680   0    687        1         ''PULL UP & FLARE DISPLAY
72700   0    688        1         ''FINAL FLARE
72750   0    684     1000         ''WOWLON
72800   0    684      100         ''WONG
72805   0    685   5   683 -18    ''AUTO-BF
72875   0    685   5   682  -5    ''IDLE MODE GN&C
72900   0    685   5   689  -5    ''IDLE MODE SM
N
```

Preset conditions for these runs were:

```
S X638 = 72000              ''START TIME FOR UTILIZATION REPORT
S X640 = 1                  ''TIME MGT ENABLED
S X641 = 1                  ''DOWNLIST ENABLED
S X656 = 72000          ''START TIME GROUP 1 TASKS
S X657 = 72000          ''START TIME GROUP 2 TASKS
S X658 = 72000          ''START TIME GROUP 3 TASKS
S X659 = 72245          ''START TIME GROUP 4 TASKS
S X660 = 72000          ''START TIME GROUP 5 TASKS
S X682 = 12         ''PRESEP GN&C MODE
S X683 = 1          ''AUTO-P
S X684 = 1          ''IMU RELEASED
S X689 = 3          ''SYSTEM MONITOR SM MODE
S X695 = 3          ''PRESENT SM MODE
S X696 = 12         ''PRESENT GN&C MODE
```

5.2.6 Test Analysis and Documentation (S.O.W. 2.1.6).

The following paragraphs describe in detail the work performed under this task. It included preparation of a draft Test Plan (Reference 5) which was submitted to NASA in January 1976, and which culminated in this Final Report.

5.2.6.1 Simulation Results. The simulation runs executed as described in paragraph 5.2.4 produced an abundance of results by means of history printouts and statistical reports.

A short description of these types of reports follows.

a. Statistical Reports.
For a quick analysis, 10 statistical reports were printed out at the end of each simulation run.

1. Job and Task Reports.
Reports numbered 2 and 4 gave statistical data on the total number of jobs, tasks, and messages that are initiated, completed, interrupted, delayed, in progress, number of activations, etc.

2. Utilization Reports.
Reports 13 through 18 provided statistical data for processors, memories storages, devices, data links, and data sets. These reports gave utilization of processors, devices, etc.; total usage, maximum and average times and rates.

Each prototype report was repeated for as many units as are specified on the input forms, e.g., one copy of report 16 for each central processor.

3. Backlog Reports.
Reports 20 and 21 provided the transaction backlog with maximum, average and current figures plus the average delay time in ms for the key blocks in the model.

b. Data Flow Reports.
These reports presented the activities that took place in the model during a simulation run. They are also considered to be history printouts.

1. Message Reports.
Reports 5 and 6 gave all the particulars for each of the data flow messages, such as message length, origin (source), and destination (sink) of the data message, time of occurence, transmission rate, data bus number, etc.

2. Job Reports. Reports 8 and 9 indicated at what time a job started and finished and total time consumed for job execution.

3. Task Reports.
Reports 25 through 28 and report 31 gave all details of task transactions during a run such as start and finish of a task, execution time, message wait, task interruption, computation time, etc.

c. Control Reports.
These reports were provided to detect situations in which capacities are exceeded or unusual activities take place. Report 12 gave a printout of errors occurring during a simulation run. Report 42 was used as a control tool to evaluate the various system capacities during a simulation run.

The report numbering is not sequential as numbered reports were changed, added, or deleted during previous versions of IMSIM.

Representative printouts of these reports followed concentrated simulation runs as defined in Section 5.2.5.2, and are given in Appendix D for the Statistical Reports and Control Reports, and in Appendix C for the Data Flow Reports that occurred during these simulation runs.

The results of the analysis of these runs and reports is given in Section 2 - Results, and in Section 3 - Conclusions, of this Final Report.

Some runs were plotted for easier analysis of delays and functional interruptions. Part of such a plot of a concentrated simulation run is given in Figure 2-2.

It is clear that every 40 ms the System Software Interface Processor and the Fast Cycle Executive interfere with each other as the Fast Cycle Executive gets interrupted every 40 ms time slice because of its lower priority. An offset timewise of 10 ms in every 40 ms cycle could solve this problem.

Lower priority tasks experience delays in their execution from 1 ms up to 58 ms (see Figure 2-3).

5.2.6.2 Backlogs and Delays. Many of the problems of congestion and contention for resources which are present in most data processing systems are automatically measured and reported during simulation runs using IMSIM. The DDPS design eliminates the possibility of a number of these problems. Furthermore, some of the measurements gathered by IMSIM relate directly to input specifications and parameters, and therefore provide no insight into the dynamic system behavior. Data which are meaningful in the context of DDPS simulation are extracted from the general simulation results and presented in Section 2. The following discussion pertains to the general results, as printed in reports 20 and 21, and may prove useful in indicating problems which the DDPS design has avoided or minimized.

Scheduled processes are essentially independent of each other (i.e., they are not organized in predecessor-successor relationships), so that backlogs of dependent tasks - measured in IMSIM block 1138 - do not develop.

Memory is allocated and programs and data loaded as required for major functions of the ALT, prior to the Mated/Drop Test. Thus, the nominal allocation activity - measured in IMSIM block 1151 - is not relevant to the DDPS model. For the same reason, the following measurements are not meaningful:

a. the backlog of program elements which cannot be allocated due to lack of space in virtual memory - block 1488

b. program elements currently in loading - block 1495

c. executive (FCOS) service for loading of program elements - block 1935

d. time spent in consolidating virtual memory space - block 1936

e. the backlog of elements waiting for space in specific memory units - block 6002

f. the backlog of elements waiting for space in any memory units - block 10052.

The time used by FCOS in activating processes is integrated with the scheduled processes, and job/task initiation service - measured by block 1204 - is bypassed.

The number of scheduled processes in the DDPS does not vary with time. Thus, block 1201, which measures the number of schedulable tasks, simply records the number of scheduled processes introduced to the model.

Statistics relating to processes in actual execution (i.e., having a CPU assigned) are recorded in two IMSIM blocks - block 1184 measures task execution with given computational values, while block 1192 measures execution with generated computation as needed to simulate production of output messages. Times recorded in these blocks are fragmented by task interruptions and thus indicate only the time periods continuously devoted to individual tasks. Data for these blocks, from various simulation runs, are shown in Appendix D.

Tasks which enter a "wait" state for completion of I/O are recorded in IMSIM block 1182. These data are presented for various simulation runs in Appendix D.

The DDPS is not configured as a multiprocessor (i.e., two or more CPUs cannot address the same main memory unit). IMSIM block 1185 records interference between processors in addressing the same memory; it has no useful information for the DDPS simulation.

The queue of processes that are ready for dispatching, either as the result of scheduling or as a consequence of interruption by higher priority processes, is represented by the backlog of tasks recorded in IMSIM block 3032. Data pertaining to this backlog for various simulation runs is shown in Appendix D.

So-called cyclic scheduling of IMSIM is not the same as the scheduling of cyclic processes within the DDPS. Rather, it refers to a "round robin" scheduling algorithm; since the latter is not simulated, the data pertaining to task queues for this type of scheduling - recorded in blocks 3004 and 3005 - are absent in summary printouts of DDPS simulation runs.

Task switchover time (i.e., the time it takes FCOS to store the status of an interrupted process and establish status for the interrupting task) is assumed to be well below the 1 ms threshold of time resolution, and statistics on switchover time - recorded in IMSIM block 3089 - are not significant.

As defined for IMSIM, "sink-driven" messages represent transmissions which are initiated in conjunction with task execution. If they are to be deferred until some time after the start of a task, a "start" specification is included in the message definition (IMSIM Form 5). IMSIM block 1605 records statistics

on message delays due to the start conditions. If a sequence of transmissions is defined as a sink-driven message, IMSIM block 1846 records statistics on the times between successive transmissions of the message. Sink-driven message transmissions are kept in synchronization with tasks as required and statistics on sync delays are recorded in block 1847; no such sync delays were recorded for DDPS transmissions.

All DDPS processes are described as repeatable or "cyclic" tasks to IMSIM. Since block 1601 records data for noncyclic tasks, it has no function in the DDPS model.

Only response messages were characterized as "source-driven" for the DDPS model; this was done to achieve responses independently of process performance. Thus, statistics on source-driven message delays for transmission starts - recorded in blocks 1608 and 1851 - is irrelevant to the DDPS model. Response time is specified as an input parameter via IMSIM Form 5; statistics on response transmission response periods is recorded in block 1675.

Since the DDPS software is designed as a single, integrated unit, there is no need to employ the concept of "nonsharable" resources (i.e., resources such as bus terminals which must be reserved for use by a single task). Thus, backlog statistics on tasks which must acquire nonsharable resources - recorded in IMSIM blocks 1682 and 1686 - are not relevant.

Mass memory is not employed in the Mated/Drop Test simulation and since no other components of the DDPS are represented as auxiliary storage devices for data transmission, statistics relating to the use of such components - recorded in blocks 1706, 1707, and 1748 - are not relevant.

No statistics are recorded on I/O initiation and completion interrupt service, since these functions are incorporated in the software representation and are assumed to require negligible processor time (considering the 1 ms time resolution of the DDPS model); thus data on periods during which these functions are performed - recorded in blocks 1693 and 1808 - are absent.

Statistics were recorded in the backlogs which develop when message transmissions are deferred due to current use of a data bus or bus terminal required for the transmission. These data are recorded in blocks 1708, 1712, 1738, and 8005. No backlogs of this nature were observed in the DDPS simulation runs.

Since multiplexed transmission links are not employed in the DDPS model, statistics on acquisition of such links - recorded by block 1734 - are absent.

Statistics were gathered on transmission backlogs which develop as the result of I/O saturation of memory (i.e., a condition in which a sufficient portion of the memory access cycles are being utilized during a period to preclude additional, fixed-rate transmission). These data are recorded in blocks 1751 and 1753. No backlogs of this nature were observed in the DDPS simulation runs.

The IMSIM block 1754 records data concerning the transmission periods of all messages which are sent during a simulation run.

Reset periods for bus terminals were defined as zero, to represent negligible time periods. Thus, data gathered on device reset periods in IMSIM block 9052 are not meaningful.

5.2.6.3 Unresolved Problems. The results of this dynamic loading analysis study will be affected by the change in the logic for the Guidance, Navigation and Control functions. This change occurred with the release of new detailed GN&C data that were received in February 1976, after tasks 1 through 4 reached scheduled completion. Further effort is required to define the new requirements for those functions and to assess the impact on the Shuttle Orbiter DDPS by modeling these newly developed requirements (see Section 4.2, item b).

Completion of these activities will result in an effective augmentation of the recently completed ALT simulation analyses, and will supply a deeper insight into the feasibility of performing ALT functions under stress conditions.

5.2.6.4 Documentation. The documentation part of this task resulted in the following publications:

a. A draft Test Plan for DDPS Dynamic Loading Analysis, TM-(L)-5328/822/00 dated 15 December 1975.

b. Ten monthly Progress Reports, TM-(L)-5561/001/00 through TM-(L)-5561/010/00, issued at end of each month during the contract period (DRL Item No. 1).

c. A Final Report on DDPS Dynamic Loading Analysis, TM-(L)-5658/000/00 dated 30 April 1976 (DRL Item No. 2).

No related written or oral presentations at professional meetings or in professional journals were made in the course of this contract. Thus, no publications were made by SDC in conjuction with DRL Item No. 3, "Revision of Technical Information Releases".

APPENDIX A

NASA.REVAR15.DATA

This Appendix provides the matrix values of the Variables, discussed in paragraphs 5.2.4.2 and 5.2.4.3, and the revisions, discussed in paragraph 5.2.4.1, which were used in the IMSIM 03B model.

```
''    NASA.REVAR15.DATA - 03/22/76
''VARIABLES:

        ''COMP TIME FOR ROUTINE 301
V350 = (0.98 + V351 + V352) * 0.48

V351 = DFN (X683, X684)(
0.225       1        0
0.23        1        1
0.26        1        2
0.18        1        4
0.23        1        8
0.485       2        0
0.475       2        2
0.43        2        4
0.485       2        8
0.295       2       16
0           3        0
0.035       3        2
0           3        4
0.211      11        0
0.615      12        0
0.5        12        8
0.615      12       16
0          13        0
0.035      13        2
0          13        4
0.16       21        0
0.24       22        0
0          23        0)

V352 = DFN (X681, X682)(
0.31        0        0
2.2         1        0
2.15        1       12
2.5         1       13
2.565       1       14
2.67        1       16
4.685       2        0
4.635       2       12
4.985       2       13
5.05        2       14
5.155       2       16
4.685       4        0
4.635       4       12
```

```
4.985       4        13
5.05        4        14
5.155       4        16
1.0         8         0
1.03        8        16
2.890       9         0
2.840       9        12
3.19        9        13
3.255       9        14
3.39        9        16
5.375      11         0
5.325      11        12
5.675      11        13
5.74       11        14
5.875      11        16
5.375      15         0
5.325      15        12
5.675      15        13
5.74       15        14
5.875      15        16
2.89       16         0
2.84       16        12
3.19       16        13
3.255      16        14
3.39       16        16
5.375      19         0
5.325      19        12
5.675      19        13
5.74       19        14
5.875      19        16)

        ''COMP TIME FOR ROUTINE 309
V353 = DFN (X682)(
2.88         0
2.544       10)

        ''COMP TIME FOR ROUTINE 310
V354 = DFN (V366, X682)(
1.2          0         0
0.84         0        10
0.48         1         0
0.408        1        10)

        ''COMP TIME FOR ROUTINE 42
V355 = 0.744 + (RF1) * 0.144

        ''COMP TIME FOR ROUTINE 45
V356 = 0.3456 + (RF1) * 0.0528

        ''COMP TIME FOR ROUTINE 308
V357 = (1.9 + V358) * 0.48
V358 = DFN (X682)(
1.05         0
0.75        11)
```

```
        ''COMP TIME FOR ROUTINE 31
V359 = DFN (X700)(
     0          0
    0.0144      6
     0          7
    0.0144     12)

        ''COMP TIME FOR ROUTINE 302
V360 = DFN (V366, V367)(
     365        0      0
     363        0      1
     365        1      1)

V361 = V(V360)

        ''COMP TIME FOR ROUTINE 303
V362 = (0.56 + (RF1) * 0.03) * 0.48

V363 = X73 - X73

        ''COMP TIME FOR ROUTINES 134 & 135
V364 = (0.5 + (RF1) * 30 + X44) * 0.48

V365 = V362 + V356 + 0.3168

        ''80 MS TIMESLICE
V366 = X681'2

        ''PLATFORM RELEASE
V367 = X684'2

        ''COMP TIME FOR ROUTINE 306
V368 = (X44 + V369) * 0.48

V369 = DFN (X682)(
     0.3        0
     0.34      10
     0.16      15
     0.34      16)

        ''COMP TIME FOR ROUTINE 307
V370 = V(V379)

        ''SET TIME FOR SAVEX 681
V371 = V375 + V376

V372 = C1'80

V373 = C1'320
```

```
V374 = C1'2000

V375 = DFN (V372, V373)(
    111       0      0
    001       0     40
    011       0    160
    001       0    200
    000      40      0)

V376 = DFN (V374)(
   11000      0
       0     40
    1000   1000
       0   1040)

        ''SET TIME SLICE COUNTER X700
V377 = X700'12 + 1

        ''CONDITION FOR GMA OPERATION
V378 = DFN (X682, V367)(
     1        0     0
     0       10     0
     1       10     1)

        ''COMP TIME FOR ROUTINE 307
V379 = DFN (X682)(
   363        0
   393       15)

        ''SINKS FOR FF MESSAGES
V380 = P8 + 60008

        ''SINKS FOR FA MESSAGES
V381 = P8 + 60012

        ''SINKS FOR DDU MESSAGES
V382 = P8 + 60016

        ''SOURCES FOR ICC MESSAGES
V383 = P7 + 70001

        ''SINKS FOR ICC MESSAGES
V384 = P8 + 70001

        ''NEW DISPLAY DETERMINATION
V385 = DFN (X685)(
        0      0
        1      1
        0      6
        1     19
```

```
       0     20)

        ''COMP TIME FOR ROUTINE 155
V386 = DFN (G1551)(
     0.0024     0
     0.096      1)

        ''COMP TIME FOR ROUTINE 317
V387 = DFN (G1551)(
     0.0456     0
     0.12       1)

V388 = DFN (X685)(
     20090      1
     20100      2
     20150      3
     20162      4
     20181      5
     20015      6)

''BRANCHES FOR GUC TASKS
V389 = DFN (X699)(
    20104       0
    20110      10
    20104      11
    20130      12
    20140      13
    20104      16)

       ''COMP TIME FOR ROUTINE 304
V390 = (0.09 + V391) * 0.48

V391 = 0.01 + X687 * V392

V392 = DFN (X685, X682)(
     0.38     0      0
     0.345    0     14
     0.375    0     15
     0.385    0     16
      0       3      0
     0.38     4      0
     0.345    4     14
     0.375    4     15
     0.385    4     16
     0.345    5     14
     0.375    5     15
     0.385    5     16
      0       6      0)

        ''COMP TIME FOR ROUTINE 307
```

```
V393 = DFN (X688)(
     0.0432     1
     0.0576     3
     0.0384     4)

        ''COMP TIME FOR ROUTINE 312
V394 = DFN (X700)(
     0.25       1
     0.075      2
     0.116      3
     0.316      4
     0.105      5
     0.098      6
     0.238      7
     0.129      8
     0.128      9
     0.22      10
     0.093     11
     0.154     12)

        ''COMP TIME FOR ROUTINE 315
V395 = DFN (X682)(
     0.15       0
     0.085     15)

        ''COMP TIME FOR ROUTINE 315
V396 = (5.986 + V367 *  ( V395 + 0.125)) * 0.48 + V367 * V362 + V390

        ''COMP TIME FOR ROUTINE 63
V397 = (V398 + X44) * 0.48

V398 = DFN (X685)(
    0.005      1
    0.135      2)

        ''MASS MEMORY ACCESS TIME
V399 = X44 + V400


V400 = CFN (RF1)(
     0         0
   100       0.1
   500       0.2
  1000       0.3
  1600       0.4
  2300       0.5
  3100       0.6
  4000       0.7
  5000       0.8
  6200       0.9
```

```
  7500       0.99)

      ''GO/NO GO SETTING TASKS
V401 = G1501
V402 = G1502
V403 = G1503
V404 = G1504
V405 = G1505
V406 = G1506
V407 = G1507
V408 = G1508
V409 = G1509
V410 = G1510
V411 = G1511
V412 = G1512
V413 = G1513
V414 = G1514
V415 = G1515
V416 = G1516
V417 = G1517
V418 = G1518
V419 = DFN (X698, X682)(
   1         0       0
   0         0       2)

V420 = G1520
V421 = G1521
V422 = G1522
V423 = G1523

      ''TIME SLICE COUNTER FOR DATA ACQ
V424 = X697'10 + 1

      ''COMP TIME FOR ROUTINE 316
V425 = DFN (X685)(
     0.0624   0
     0.1536   4
     0.0624   5)

      ''FOR GATE SETTING PROC BUFFER
V427 = DFN (RF1)(
      1      0.0
      0      0.75)

      ''COMP TIME FOR ROUTINE 312
V428 = V394 * 0.48

      ''COMP AS FN(40MS CTR) ROUTINES 140 & 151
V429 = (1 - X642'X45/(X642'X45)) * X44
```

```
      ''COMP TIME FOR ROUTINE 140
V430 = V429 * X639

      ''COMP TIME FOR ROUTINE 313
V431 = DFN (X685)(
      1.56      1       ''SPEC
      1.204     5       ''OPS
      2.51      8       ''RESUME
      0.396     9       ''EXEC & PRO
      0.662    11       ''ITEM
      2.51     19)      ''DISPLAY

      ''COMP TIME FOR ROUTINE 149
V432 = DFN (X685)(
      0.384     0
      1.104     1)

       ''MSG LENGTH FOR DEU DISPLAY IMAGE
V433 = DFN (X685)(
       0        0
    1024        1
       0        8
    1024       19
       0       20)

       ''MSG LENGTH FOR KEYBD INP
V434 = DFN (X685)(
       0        0
      10        1)

       ''COMP TIME FOR ROUTINE 314
V435 = X44*3 + X45*X687

      ''ADDITION FOR COUNTER X643
V436 = X577$X577

      '' CONDITIONS FOR OPERATION OF GEF AND GAD
V437 = DFN (X682)(
      1503      0
      1501     11)

V438 = DFN (X682)(
       8        0
       6       11)

      ''CONDITION FOR CLEARING X699 KEYBD INPUT
V439 = X699 * X698

      ''CHECK FOR SPEC TERMINATE ACTION
V440 = DFN (X699)(
```

```
      20105     0
      20150     2
      20105     3
      20110    10
      20105    11
      20130    12
      20140    13
      20105    16)

       ''CONDITION FOR GEN OPERATION
V441 = DFN (X682, V367)(
       0      0      0
       1     14      1
       0     15      0)


      ''IMSIM REVISIONS

V9 = FT(IC2)/(C1 - X638)*100$1
V109 = DFN (X(V47) X(V42))(1 0 0 0 0 1 1 1 0)
V232 = (C1 - X638)*X90/1000
V306 = B1192 + B1184
V442 = X(V29) + 69999

20000 GEN    40    0    X656    0    42
      X642 + 1              ''40 MS PULSE COUNTER
      X681 = V371           ''SET TIME SLICE
      ADMIT IF X577 = 0
      P3 = 1502
      P4 = 7                 ''SYST SW INTERF PROC - AIE
      COPY TO 20013
      P3 = 1504
      P4 = 9                 ''MINOR CYCLE EXEC - GMA
      COPY TO 20013 V378
      P3 = V437
      P4 = V438              ''FAST CYCLE EXEC - GEF OR MF/D IDLE MODE - GAD
      TRY 20013
20010 GEN    80    0    X656    0    40
      X700 = V377            ''TIME SLICE COUNTER
''    P3 = 1507
''    P4 = 18               'PREFLIGHT EXEC - GEP
''    COPY TO 20013
20011 DETOUR 20015
      ADMIT IF X682 GE 11
      ADMIT IF X577 = 0
      P3 = 1505
      P4 = 10                ''MATED DROP EXEC - GEM
20013 G(P3) = 1
      X577 = P4
      PR1 + 0
```

```
      G(P3) = 0
      PRINT R 30 30
      X643 + V436
      X577 = 0
20015 REMOVE
20020 GEN  100   0   X657   0   40
      ADMIT IF X577 = 0
      P3 = 1517
      P4 = 35              ''CYCLIC DISPLAY PROC - DCI
      TRY 20013
20030 GEN  320   0   X658   0   40
      ADMIT IF X577 = 0
      P3 = 1508
      P4 = 19              ''MAJOR CYCLE EXEC - GMG
      COPY TO V440
      TRY 20013
20040 GEN  200   0   X657   0   40
      ADMIT IF X577 = 0
      P3 = 1514
      P4 = 32              ''MCDS INPUT PROC - DMI
      TRY 20013
20050 GEN  1000  0  X659  0   40
      ADMIT IF X577 = 0
      P3 = 1518
      P4 = 37              ''GPC SWITCH MONITOR - ARA
      TRY 20013
20060 GEN  2000  0  X659  0   40
      ADMIT IF X577 = 0
      P3 = 1506
      P4 = 15              ''TAEM NAV CYCLIC EXEC - GEN
      COPY TO 20013 V441
      TRY 20105
20070 GEN   2    0    X660   0   41
      ADMIT IF X685 GQ 1
      ADMIT IF X577 = 0
      X577 = 34            ''USER INTERFACE - DMC
      G1516 = 1
      PR1 + 0
      G1516 = 0
20071 PRINT R 30 30
      X643 + V436
      X577 = 0
20072 DELAY 1
      COPY TO V388
      X685 = 0
      X687 = V385
      REMOVE
''20080 GEN 100    0   X657   0   40
''    ADMIT IF V419 = 1
''20081 ADMIT IF X577 = 0
```

```
''    P3 = 1515
''    P4 = 33              ''LDB I/O PROC - DGI
''    TRY 20013
20090 X698 = 1
      TRY 20105
20100 TRY V389
20104 G(P3) = 1
      X577 = P4
      PR1 + 0
      G(P3) = 0
20106 PRINT R 30 30
      X643 + V436
      X577 = 0
      X699 - V439
      X698 = 0
20105 REMOVE
20110 G1511 = 1
      X577 = 22            ''IMU GYROCOMPASS ALIGNMT - GMX
      PR1 + 0
      G1511 = 0
      ADMIT IF X577 = 0
20112 P3 = 1512
      P4 = 23              ''IMU VELOCITY & TILT - GMY
      TRY 20104
20130 P3 = 1509
      P4 = 20              ''IMU ATTITUDE DETERM - GMS
      TRY 20104
20140 P3 = 1510
      P4 = 21              ''IMU CALIBRATION - GMT, GMU, GMV
      TRY 20104
20150 DETOUR 20015
      ADMIT IF X699 = 2
20151 P3 = 1513
      P4 = 24              ''FCS/DD DEDICATED DISPLAY CH.OUT - GTX
      TRY 20104
20160 GEN 50  0  X657  0 40
      X697 = V424          ''SET TIME SLICE
      G1551 = V427         ''SET GATE PROC BUFFER
20161 ADMIT IF X577 = 0
      P3 = 1520
      P4 = 11              ''SM DATA ACQ
      TRY 20013
20162 G1551 = 1
      TRY 20161
20170 GEN  500  0  X657  0  40
      ADMIT IF X697 = 1    ''ONCE EVERY 10 CYCLES
      ADMIT IF X577 = 0
      P3 = 1521
      P4 = 12              ''SM PERFORM MONITOR
      TRY 20013
```

```
20180 GEN   2  0  X660  0  41
20181 ADMIT IF X682 NE X696
      X696 = X682
20182 ADMIT IF X577 = 0
      P3 = 1522
      P4 = 13              ''SM OPS 2
      TRY 20013
20185 GEN   2  0  X660  0  41
      ADMIT IF X689 NE X695
      X695 = X689
      TRY 20182
20190 GEN   2  0  X660  0  40
      ADMIT IF X685 NE 0
      ADMIT IF X577 = 0
      P3 = 1523
      P4 = 14              ''SPM SUBSYSTEM MONITOR
      TRY 20013
REPORT 2 1 1
 DURING V232    SECONDS OF SIMULATED SHUTTLE OPERATIONS
 A TOTAL OF BW1160 DIFFERENT FUNCTIONS WERE INTRODUCED.
 THESE FUNCTIONS WERE ACTIVATED BW1166 TIMES, STATUS IS:
       BW1196 WERE COMPLETED
        B1167 ARE WAITING FOR NEXT ACTIVATION
        B3032 ARE IN READY STATE, I.E. WAITING FOR CPU
        B1182 ARE WAITING FOR MESSAGES TO COMPLETE
         V306 PRESENTLY EXECUTING, I.E. IN ACTIVE STATE
 FUNCTIONS WERE INTERRUPTED BW2000 TIMES.
  X643 FUNCTION ACTIVATIONS WERE ABORTED AS FUNCTION STILL ACTIVE. ENDR
REPORT 3 1 1 0
NOT APPLICABLE FOR NASA.  ENDR
REPORT 30 1 1 X577
 AT TIME     C1 ACTIVATION FOR FUNCTION X577 ABORTED, AS
 FUNCTION X577 IS STILL ACTIVE.  ENDR

REVISE 39000 39000                    ''SPEED-UP BY ELIMINATING PROTOTYPES

REVISE 238000 238000            ''SET SAVEX FROM JOBSCHEDULE
1010  DETOUR 1012
      ADMIT IF P2 = 0
      X(P3) + P4
      DETOUR 30012
      ADMIT IF PL1 GR 0
      SAVE P5
30010 X(P6) + P7
      POP
      POP
      DETOUR 30010
      ADMIT IF PL1 = 0
30012 REMOVE
1012  P2 = V153
```

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```
REVISE 649000 661000                    ''SPEED-UP BY ELIMINATING V.M. & MEM.RECO
      TRY 1352

REVISE 663000 680000                ''SPEED-UP BY ELIMIN. V.M. & MEMORY RECORDING
      X(V67) = 1


       ''SUPPRESS ZERO LENGTH TRANSMISSION
REVISE 881000 881000                  ''SUPPRESS ZERO LENGTH TRANSMISSION
      DETOUR 1606
      ADMIT IF P3 = 0
      POP P2
      TRY 1865
1606  P2 = P6

REVISE 1134000 1134000                 ''PREVENT COMP TIME FROM MESSAGES
      ADMIT IF X(P2) = 1
SOURCE PRIMARY
END OF DATA
```

APPENDIX B

NASA.SPECS20.DATA

```
''   NASA.SPECS20.DATA  -  03/27/76                                          00000010
''                                                                          00000020
''   SIMULATION SPECIFICATIONS FOR SPACE SHUTTLE ORBITER                    00000030
''   ONBOARD DATA PROCESSING SYSTEM                                         00000040
''                                                                          00000050
''   PRODUCED BY THE SYSTEM DEVELOPMENT CORPORATION                         00000060
''                                                                          00000070
''   D..A ARE PREPARED ON IMSIM SPECIFICATION FORMS, AS DESCRIBED IN        00000080
''   SDC PUBLICATION TM-5328/102, "IMSIM INFORMATION MANAGEMENT SYSTEM      00000090
''   SIMULATOR USER'S MANUAL".                                              00000100
''                                                                          00000110
''**** JOBS ************************************************************** 00000120
''                                                                          00000130
''     FIVE JOBS ARE INCLUDED IN THE MODEL.  JOB 1 IS RESERVED FOR THE      00000140
''     SIMULATION EXECUTIVE.  JOBS 2 THROUGH 5 ENCOMPASS ALL                00000150
''     FUNCTIONS OF THE ONBOARD DATA PROCESSING SYSTEM.                     00000160
''     JOB 2 REPRESENTS THE WORKLOAD FOR GPC 1,                             00000170
''     JOB 3 REPRESENTS THE WORKLOAD FOR GPC 2, ETC.                        00000180
''                                                                          00000190
''  JOB        TASK        PRIORITY              NATURE        GO/NOGO      00000200
''                      RELATIVE ABSOLUTE      (CYCLIC)      VARIABLE     00000210
''             GEF                  28                                     00000220
 1   2            6          8                    2            401         00000230
''             AIE                  29                                     00000240
 1   2            7          9                    2            402         00000250
''             GAD                  26                                     00000260
 1   2            8          6                    2            403         00000270
''             GMA                  27                                     00000280
 1   2            9          7                    2            404         00000290
''             GEM                  24                                     00000300
 1   2           10          4                    2            405         00000310
''             SDA                  25                                     00000320
 1   2           11          5                    2            420         00000330
''             SDM                   5                                     00000340
 1   2           12          5                    2            421         00000350
''             SFO                  25                                     00000360
 1   2           13          5                    2            422         00000370
''             SPM                  25                                     00000380
 1   2           14          5                    2            423         00000390
''             GEN                   7                                     00000400
 1   2           15          7                    2            406         00000410
''             GMG                   6                                     00000420
 1   2           19          6                    2            408         00000430
''             GMS                   1                                     00000440
 1   2           20          1                    2            409         00000450
''             GMT,GMU,GMV           3                                     00000460
 1   2           21          3                    2            410         00000470
''             GMX                   2                                     00000480
 1   2           22          2                    2            411         00000490
''             GMY                   5                                     00000500
```

```
1   2       23      5                       2       412     00000510
''          GTX             4                               00000520
1   2       24      4                       2       413     00000530
''          DMI             25                              00000540
1   2       32      5                       2       414     00000550
''          DMC             23                              00000560
1   2       34      3                       2       416     00000570
''          DCI             21                              00000580
1   2       35      1                       2       417     00000590
''          ARA             9                               00000600
1   2       37      9                       2       418     00000610
''                                                          00000620
''          GEF             28                              00000630
1   3       106     8                       2       401     00000640
''          AIE             29                              00000650
1   3       107     9                       2       402     00000660
''          GAD             26                              00000670
1   3       8       6                       2       403     00000680
''          GMA             27                              00000690
1   3       9       7                       2       404     00000700
''          GEM             24                              00000710
1   3       10      4                       2       405     00000720
''          SDA             25                              00000730
1   3       111     5                       2       420     00000740
''          SDM             5                               00000750
1   3       12      5                       2       421     00000760
''          SFO             25                              00000770
1   3       13      5                       2       422     00000780
''          SPM             25                              00000790
1   3       14      5                       2       423     00000800
''          GEN             7                               00000810
1   3       15      7                       2       406     00000820
''          GMG             6                               00000830
1   3       19      6                       2       408     00000840
''          GMS             1                               00000850
1   3       20      1                       2       409     00000860
''          GMT,GMU,GMV     3                               00000870
1   3       21      3                       2       410     00000880
''          GMX             2                               00000890
1   3       22      2                       2       411     00000900
''          GMY             5                               00000910
1   3       23      5                       2       412     00000920
''          GTX             4                               00000930
1   3       24      4                       2       413     00000940
''          DMI             25                              00000950
1   3       32      5                       2       414     00000960
''          DMC             23                              00000970
1   3       134     3                       2       416     00000980
''          DCI             21                              00000990
1   3       135     1                       2       417     00001000
```

''		ARA		9			00001010
1	3	37	9		2	418	00001020
''							00001030
''		GEF		28			00001040
1	4	106	8		2	401	00001050
''		AIE		29			00001060
1	4	107	9		2	402	00001070
''		GAD		26			00001080
1	4	8	6		2	403	00001090
''		GMA		27			00001100
1	4	9	7		2	404	00001110
''		GEM		24			00001120
1	4	10	4		2	405	00001130
''		SDA		25			00001140
1	4	111	5		2	420	00001150
''		SDM		5			00001160
1	4	12	5		2	421	00001170
''		SFO		25			00001180
1	4	13	5		2	422	00001190
''		SPM		25			00001200
1	4	14	5		2	423	00001210
''		GEN		7			00001220
1	4	15	7		2	406	00001230
''		GMG		6			00001240
1	4	19	6		2	408	00001250
''		GMS		1			00001260
1	4	20	1		2	409	00001270
''		GMT,GMU,GMV		3			00001280
1	4	21	3		2	410	00001290
''		GMX		2			00001300
1	4	22	2		2	411	00001310
''		GMY		5			00001320
1	4	23	5		2	412	00001330
''		GTX		4			00001340
1	4	24	4		2	413	00001350
''		DMI		25			00001360
1	4	32	5		2	414	00001370
''		DMC		23			00001380
1	4	134	3		2	416	00001390
''		DCI		21			00001400
1	4	135	1		2	417	00001410
''		ARA		9			00001420
1	4	37	9		2	418	00001430
''							00001440
''		GEF		28			00001450
1	5	106	8		2	401	00001460
''		AIE		29			00001470
1	5	107	9		2	402	00001480
''		GAD		26			00001490
1	5	8	6		2	403	00001500

```
''               GMA                 27
 1   5             9          7                   2            404
''               GEM                 24
 1   5            10          4                   2            405
''               SDA                 25
 1   5           111          5                   2            420
''               SDM                  5
 1   5            12          5                   2            421
''               SFO                 25
 1   5            13          5                   2            422
''               SPM                 25
 1   5            14          5                   2            423
''               GEN                  7
 1   5            15          7                   2            406
''               GMG                  6
 1   5            19          6                   2            408
''               GMS                  1
 1   5            20          1                   2            409
''               GMT,GMU,GMV          3
 1   5            21          3                   2            410
''               GMX                  2
 1   5            22          2                   2            411
''               GMY                  5
 1   5            23          5                   2            412
''               GTX                  4
 1   5            24          4                   2            413
''               DMI                 25
 1   5            32          5                   2            414
''               DMC                 23
 1   5           134          3                   2            416
''               DCI                 21
 1   5           135          1                   2            417
''               ARA                  9
 1   5            37          9                   2            418
''
''**** TASKS ***********************************************************
''
''     TASKS 1 THROUGH 6 ARE RESERVED FOR THE SIMULATION EXECUTIVE.
''     TASKS NUMBERED ABOVE 100 ARE FOR THE REDUNDANT GPC'S
''
''GEF_FC_EXEC   FAST CYCLE EXECUTIVE
''SCHEDULED AT 40MS INTERVALS BY GAV (20017) AND GAA (20016)
''         CLASS    DELAY     REQUIRED ELEMENTS
 2   6      1        0      30087  30301  50006  50007  50008  50009 *
                            50010  50011  50012  50013  50014  50015 *
                            50016  50017  50018  50019  50020  50021 *
                            50022  50023  50024  50025  50026  50027 *
                            50050  50051  50052  50053  50054  1
 2 106      1        0      30087  30301  1
''
```

```
''AIE_SIP   SYSTEM SOFTWARE INTERFACE PROCESSOR                          00002010
''SCHEDULED AT 40MS INTERVALS BY SYSTEM INITIALIZATION                   00002020
''        CLASS    DELAY     REQUIRED ELEMENTS                          00002030
 2   7      1        0       30116  30130  30138  30147  50028       * 00002040
                             50058  30151  30140  1                     00002050
 2 107      1        0       30116  30130  30138  30147  30151  30140 * 00002060
                             50028 1                                    00002070
''                                                                      00002080
''GAD_MATE_IDLE   MATED/DROP TEST IDLE MODE - 200                       00002090
''SCHEDULED AT 40MS INTERVALS BY GAA (20016) UNTIL MODE TRANSITION       00002100
''        CLASS    DELAY     REQUIRED ELEMENTS                          00002110
 2   8      1        0       30302  30303  30045  30089  1             00002120
''                                                                      00002130
''GMA_MIN_EXEC   MINOR CYCLE EXECUTIVE                                  00002140
''SCHEDULED AT 40MS INTERVALS BY GAV (20017).  IF MODE 200 IS           00002150
''ENTERED WHILE PLATFORM IS NOT RELEASED, GMA IS CANCELLED AND THEN     00002160
''RESCHEDULED AT MODE TRANSITION.                                       00002170
''        CLASS    DELAY     REQUIRED ELEMENTS                          00002180
 2   9      1        0       30042  30303  30045  1                     00002190
''                                                                      00002200
''GEM_MATE_DROP_EXEC   MATED/DROP EXECUTIVE                             00002210
''SCHEDULED AT 80MS INTERVALS BY GAA (20016) FOR MODE 201.  IF MODE     00002220
''200 IS ENTERED, GEM IS CANCELLED.                                     00002230
''        CLASS    DELAY     REQUIRED ELEMENTS                          00002240
 2  10      1        0       30304  30303  30305  30306  30089  30087 * 00002250
                             30307  30312  30031  30315  1             00002260
''                                                                      00002270
''SDA_DATA_ACQUISITION   SM DATA ACQUISITION                            00002280
''SCHEDULED AT 50MS INTERVALS BY SM OPS 1                               00002290
''        CLASS    DELAY     REQUIRED ELEMENTS                          00002300
 2  11      1        0       30155  50032  50033  1                     00002310
 2 111      1        0       30155  1                                   00002320
''                                                                      00002330
''SDM_PERFORM_MON_CONTROL   SM PERFORMANCE MONITORING CONTROL           00002340
''SCHEDULED AT 500MS INTERVALS BY SM OPS 1                              00002350
''        CLASS    DELAY     REQUIRED ELEMENTS                          00002360
 2  12      5        0       30316  30317  1                           00002370
''                                                                      00002380
'' SFO_FLIGHT_OPS   SM FLIGHT OPERATIONAL SEQUENCE (OPS 2)              00002390
''SCHEDULED BY UI SOFTWARE (20034)                                      00002400
''        CLASS    DELAY     REQUIRED ELEMENTS                          00002410
 2  13      1        0       30157  30316  1                           00002420
''                                                                      00002430
''SPM_SUBSYS_CONFIG_MON   SM SUBSYSTEM CONFIGURATION MONITORING         00002440
''PRETAKEOFF & PREDROP SM SPECS SCHEDULED BY UI SOFTWARE (20034)        00002450
''        CLASS    DELAY     REQUIRED ELEMENTS                          00002460
 2  14      1        0       30157  1                                   00002470
''                                                                      00002480
''GEN_TAEM_NAV_CYC   TAEM NAVIGATION CYCLIC EXECUTIVE                   00002490
''SCHEDULED AT 2000MS INTERVALS BY SPEC GUC (20027) UPON PLATFORM       00002500
```

```
''RELEASE REQUEST                                                          00002510
''        CLASS    DELAY     REQUIRED ELEMENTS                           00002520
 2  15      5        0       30306  30308  1                             00002530
''                                                                         00002540
''GAA_OPS2_MATED_DROP_TEST   MATED/DROP OPS CONTROL SEGMENT               00002550
''SCHEDULED BY UI SOFTWARE (20034)                                        00002560
''SERVICE LOAD ASSUMED NEGLIGIBLE.  LOGIC SIMULATED.                      00002570
''        CLASS    DELAY     REQUIRED ELEMENTS                           00002580
''  16      1        0                                                    00002590
''                                                                         00002600
''GAV_OPS1_PRE_FLT   PREFLIGHT OPS CONTROL SEGMENT                        00002610
''SCHEDULED BY UI SOFTWARE (20034)                                        00002620
''SERVICE LOAD ASSUMED NEGLIGIBLE.  LOGIC SIMULATED.                      00002630
''        CLASS    DELAY     REQUIRED ELEMENTS                           00002640
''  17      1        0       30004                                        00002650
''                                                                         00002660
''GEP_PRE_FLT_EXEC   PREFLIGHT EXECUTIVE                                  00002670
''SCHEDULED AT 80MS INTERVALS BY GAV (20017) WHILE IN MODE 101            00002680
''NOT ACTIVE DURING MATED/DROP TEST                                       00002690
''        CLASS    DELAY     REQUIRED ELEMENTS                           00002700
''  18      1        0       30304  30029  30312  30315  1              00002710
''                                                                         00002720
''GMG_MAJ_EXEC   IMU MAJOR CYCLE EXECUTIVE                                00002730
''SCHEDULED AT 320MS INTERVALS BY GMU/GMT/GMV (20021), GMX (20022),       00002740
''GMY (20023), AND GMS (20020), ALL OF WHICH ARE SCHEDULED BY             00002750
''SPEC GUC (20027).                                                       00002760
''        CLASS    DELAY     REQUIRED ELEMENTS                           00002770
 2  19      5        0       30309  30305  1                             00002780
''                                                                         00002790
''GMS_IMU_ATT   IMU ATTITUDE DETERMINATION                                00002800
''SCHEDULED BY GUC (20027)                                                00002810
''        CLASS    DELAY     REQUIRED ELEMENTS                           00002820
 2  20      5        0       30310  1                                     00002830
''                                                                         00002840
''GMT_PFLT_CALA   IMU PREFLIGHT CALIBRATION A                             00002850
''GMU_HANG_CALA   IMU HANGAR CALIBRATION    A                             00002860
''GMV_HANG_CALB   IMU HANGAR CALIBRATION    B                             00002870
''SCHEDULED BY GUC (20027)                                                00002880
''        CLASS    DELAY     REQUIRED ELEMENTS                           00002890
 2  21      5        0       30311  1                                     00002900
''                                                                         00002910
''GMX_GC_ALIGN   IMU GYROCOMPASS ALIGNMENT                                00002920
''SCHEDULED BY GUC (20027)                                                00002930
''        CLASS    DELAY     REQUIRED ELEMENTS                           00002940
 2  22      5        0       30062  1                                     00002950
''                                                                         00002960
''GMY_VEL_TILT   IMU VELOCITY AND TILT                                    00002970
''SCHEDULED BY GUC (20027) TO FOLLOW GMX (20022)                          00002980
''        CLASS    DELAY     REQUIRED ELEMENTS                           00002990
 2  23      5        0       30063  1                                     00003000
```

```
''                                                                          00003010
''GTX_DD_CKOUT   FCS/DD DEDICATED DISPLAY CHECKOUT                          00003020
''SCHEDULED BY GUG (20028)                                                  00003030
''        CLASS    DELAY     REQUIRED ELEMENTS                             00003040
 2  24      5        0       30113  1                                       00003050
''                                                                          00003060
''GUA_HORIZ_SIT   HORIZONTAL SITUATION CONTROL SEGMENT (SPEC)               00003070
''SCHEDULED BY UI SOFTWARE (20034)                                          00003080
''SERVICE LOAD ASSUMED NEGLIGIBLE.  LOGIC SIMULATED.                        00003090
''        CLASS    DELAY     REQUIRED ELEMENTS                             00003100
''  25      1        0       30105                                         00003110
''                                                                          00003120
''GUB_VERT_SIT   VERTICAL SITUATION CONTROL SEGMENT (SPEC)                  00003130
''SCHEDULED BY UI SOFTWARE (20034)                                          00003140
''SERVICE LOAD ASSUMED NEGLIGIBLE.  LOGIC SIMULATED.                        00003150
''        CLASS    DELAY     REQUIRED ELEMENTS                             00003160
''  26      1        0       30106                                         00003170
''                                                                          00003180
''GUC_IMU_OPRTNS   IMU OPERATION CONTROL SEGMENT (SPEC)                     00003190
''SCHEDULED BY UI SOFTWARE (20034)                                          00003200
''SERVICE LOAD ASSUMED NEGLIGIBLE.  LOGIC SIMULATED.                        00003210
''        CLASS    DELAY     REQUIRED ELEMENTS                             00003220
''  27      1        0       30107                                         00003230
''                                                                          00003240
''GUG_FCS_DD_CKOUT   FCS/DED. DISPLAY CHECKOUT CONTROL SEGMENT (SPEC)       00003250
''SCHEDULED BY UI SOFTWARE (20034)                                          00003260
''SERVICE LOAD ASSUMED NEGLIGIBLE.  LOGIC SIMULATED.                        00003270
''        CLASS    DELAY     REQUIRED ELEMENTS                             00003280
''  28      1        0       30108                                         00003290
''                                                                          00003300
''GUH_RM_NAV   RM-NAV CONTROL SEGMENT (SPEC)                                00003310
''SCHEDULED BY UI SOFTWARE (20034)                                          00003320
''SERVICE LOAD ASSUMED NEGLIGIBLE.  LOGIC SIMULATED.                        00003330
''        CLASS    DELAY     REQUIRED ELEMENTS                             00003340
''  29      1        0       30109                                         00003350
''                                                                          00003360
''GUI_RM_CONT_KYBD_PROC   RM-CONT CONTROL SEGMENT                           00003370
''SCHEDULED BY UI SOFTWARE (20034)                                          00003380
''SERVICE LOAD ASSUMED NEGLIGIBLE.  LOGIC SIMULATED.                        00003390
''        CLASS    DELAY     REQUIRED ELEMENTS                             00003400
''  30      1        0       30110  30112                                  00003410
''                                                                          00003420
''GUK_NAV_TRGT_UPDT   NAV/TARGET UPDATE CONTROL SEGMENT (SPEC)              00003430
''SCHEDULED BY UI SOFTWARE (20034)                                          00003440
''SERVICE LOAD ASSUMED NEGLIGIBLE.  LOGIC SIMULATED.                        00003450
''        CLASS    DELAY     REQUIRED ELEMENTS                             00003460
''  31      1        0       30111                                         00003470
''                                                                          00003480
''DMI_MCDS_IN   MCDS INPUT PROCESSOR                                        00003490
''SCHEDULED AT 200MS INTERVALS BY SYSTEM INITIALIZATION                     00003500
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''         CLASS     DELAY      REQUIRED ELEMENTS                              00003510
 2  32       1         0        30148  30149  1                               00003520
''                                                                             00003530
''DGI_LDB_IO   LDB I/O PROCESSOR                                               00003540
''SCHEDULED AT REGULAR INTERVALS BY SYSTEM CONTROL/INITIALIZATION              00003550
''NOT USED DURING MATED/DROP TEST                                              00003560
''         CLASS     DELAY      REQUIRED ELEMENTS                              00003570
''  33       5         0        30136  30141  30149  1                        00003580
''                                                                             00003590
''DMC_SUPER   USER INTERFACE                                                   00003600
''SCHEDULED BY SYSTEM INITIALIZATION                                           00003610
''         CLASS     DELAY      REQUIRED ELEMENTS                              00003620
 2  34       1         0        30313  50059  50060  1                        00003630
''                                                                             00003640
 2 134       1         0        30313  1                                      00003650
''DCI_CYC_DISPLAY   CYCLIC DISPLAY PROCESSING                                  00003660
''SCHEDULED AT 100MS INTERVALS BY SYSTEM INITIALIZATION                        00003670
''         CLASS     DELAY      REQUIRED ELEMENTS                              00003680
 2  35       1         0        30314  50055  50056  50057  1                00003690
 2 135       1         0        30314  1                                      00003700
''                                                                             00003710
''DDC_DWN_LST_CONTROLS   DOWNLIST DATA CONTROLS PROCESSOR                      00003720
''SCHEDULED BY SPEC ASD, WHICH IS NOT INVOKED DURING MATED/DROP TEST           00003730
''         CLASS     DELAY      REQUIRED ELEMENTS                              00003740
''  36       1         0        30135                                          00003750
''                                                                             00003760
''ARA_GPC_SWITCH   GPC SWITCH MONITOR                                          00003770
''SCHEDULED AT 1000MS INTERVALS BY SYSTEM INITIALIZATION                       00003780
''         CLASS     DELAY      REQUIRED ELEMENTS                              00003790
 2  37       5         0        30118  1                                      00003800
''                                                                             00003810
''DCS_SYNC   GPC/PCMMU DATA CYCLE SYNCHRONIZER                                 00003820
''SCHEDULED BY DDC (20036)                                                     00003830
''NOT REQUESTED DURING OPS2.  DCD IS ASSUMED TO BE ENABLED.                    00003840
''         CLASS     DELAY      REQUIRED ELEMENTS                              00003850
''  38       1         0        30134                                          00003860
''                                                                             00003870
''SPO_PREFLISGHT_OPS   SM PREFLIGHT OPERATIONAL SEQUENCE (OPS 1)               00003880
''SCHEDULED BY UI SOFTWARE (20034)                                             00003890
''NOT USED DURING MATED/DROP TEST                                              00003900
''         CLASS     DELAY      REQUIRED ELEMENTS                              00003910
''  39       1         0                                                       00003920
''                                                                             00003930
''                                                                             00003940
''**** ROUTINES ********************************************************     00003950
''                                                                             00003960
''     EACH FUNCTION OR SET OF FUNCTIONS CALLED IN PERFORMANCE OF A            00003970
''     SCHEDULED TASK IS DEFINED AS A ROUTINE.  ROUTINE 1 IS RESERVED          00003980
''     FOR THE SIMULATION EXECUTIVE.  ROUTINES WITH NUMBERS GREATER            00003990
''     THAN 300 REPRESENT SETS OF FUNCTIONS.                                   00004000
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''                                                                          00004010
''PREFLIGHT OPS CONTROL SEGMENT   (TASK 17)                                 00004020
''   GAV_OPS1_PRE_FLT                                                       00004030
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME       00004040
''   4    0    110001       1          0    10       442     16 0.4        00004050
''                                                                          00004060
''PREFLIGHT EXECUTIVE   (TASK 18)                                          00004070
''   GEP_FRE_FLT_EXEC                                                       00004080
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME       00004090
'' 29   0    110001       1          0    10       442     16 0.4        00004100
''                                                                          00004110
''NAVIGATION TRANSITION TASK                                               00004120
''   GET_NAV_TRANS                                                          00004130
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME       00004140
'' 30   0    110001       1          0    10       442     16 0.4        00004150
''                                                                          00004160
''TAEM GUIDANCE   (TASK 10)                                                00004170
''   GGA_TAEM_GUID                                                          00004180
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME       00004190
 3  31   1    110001       1          0     10       442   359 0           00004200
''                                                                          00004210
''IMU MINOR CYCLE EXECUTIVE   (TASK 9)                                     00004220
''   GMA_MIN_EXEC                                                           00004230
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME       00004240
 3  42   1    110001       1          0    10       442   355 0           00004250
''                                                                          00004260
''IMU RESOLVER PROCESSOR   (TASKS 8, 9)                                    00004270
''   GMD_RES_PROC                                                           00004280
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME       00004290
 3  45   1    110001       1          0    10       442   356 0           00004300
''                                                                          00004310
''IMU GYRO-COMPASS ALIGNMENT   (TASK 22)                                   00004320
''   GMX_GC_ALIGN                                                           00004330
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME       00004340
 3  62   1    110001       1          0    10       442     16 0.4        00004350
''                                                                          00004360
''IMU VELOCITY TILT   (TASK 23)                                            00004370
''   GMY_VEL_TILT                                                           00004380
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME       00004390
 3  63   1    110001       1          0    10       442   397 0.26        00004400
''                                                                          00004410
''FDI FCS SELECTION FILTER   (TASKS 6, 10)                                 00004420
''   GRA_FCS_SF                                                             00004430
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME       00004440
 3  87   1    110001       1          0    10       442   16 0.206        00004450
''                                                                          00004460
''FDI NAVAID SELECTION FILTER   (TASKS 8, 10)                              00004470
''   GRC_NAVAID_SF                                                          00004480
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME       00004490
 3  89   1    110001       1          0    10       442   16 0.019        00004500
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''                                                                    00004510
''SPEC HORIZONTAL SITUATION CONTROL SEGMENT   (TASK 25,               00004520
''  GUA_HORIZ_SIT                                                     00004530
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME  00004540
'' 105   1    110001      1          0     10       442     16 0.4    00004550
''                                                                    00004560
''SPEC VERICAL SITUATION CONTROL SEGMENT   (TASK 26)                  00004570
''   GUB_VERT_SIT                                                     00004580
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME  00004590
'' 106   1    110001      1          0     10       442     16 0.4    00004600
''                                                                    00004610
''SPEC IMU OPERATIONS CONTROL   (TASK 27)                            00004620
''   GUC_IMU_OPRTNS                                                   00004630
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME  00004640
'' 107   1    110001      1          0     10       442     16 0.4    00004650
''                                                                    00004660
''SPEC FCS/DEDICATED DISPLAY CHECKOUT CONTROL SEGMENT   (TASK 28)    00004670
''   GUG_FCS_DD_CKOUT                                                 00004680
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME  00004690
'' 108   1    110001      1          0     10       442     16 0.4    00004700
''                                                                    00004710
''SPEC RM-NAVIGATION CONTROL SEGMENT   (TASK 29)                      00004720
''   GUH_RM_NAV                                                       00004730
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME  00004740
'' 109   1    110001      1          0     10       442     16 0.4    00004750
''                                                                    00004760
''SPEC RM-CONT CONTROL SEGMENT   (TASK 30)                           00004770
''   GUI_RM_CONT                                                      00004780
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME  00004790
'' 110   1    110001      1          0     10       442     16 0.4    00004800
''                                                                    00004810
''SPEC NAV/TARGET UPDATE CONTROL SEGMENT   (TASK 31)                  00004820
''   GUK_NAV_TRGT_UPDT                                                00004830
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME  00004840
'' 111   1    110001      1          0     10       442     16 0.4    00004850
''                                                                    00004860
''RM-CONTROL KEYBOARD PROCESSOR   (TASKS 16, 30)                      00004870
''   GKR_RM_CONT_KYBD_PROC                                            00004880
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME  00004890
'' 112   1    110001      1          0     10       442     16 0.4    00004900
''                                                                    00004910
''DD DEDICATED DISPLAY CHECKOUT   (TASK 24)                          00004920
''   GTX_DD_CKOUT                                                     00004930
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME  00004940
 3 113   1    110001      1          0     10       442     16 0.4    00004950
''                                                                    00004960
''GPC LOCATOR                                                        00004970
''   AIB_GPC_LOCATOR                                                  00004980
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME  00004990
'' 114   0    110001     1080        0     10       442     16 0.24   00005000
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''                                                                          00005010
''GPC STARTUP                                                               00005020
''   AIC_GPC_STARTUP                                                        00005030
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005040
'' 115    0    110001     660          0     10      442    16 0.24        00005050
''                                                                          00005060
''SYSTEM INTERFACE PROCESSOR    (TASK 7)                                    00005070
''   AIE_SIP                                                                00005080
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005090
 3 116    0    110001     800          0     10      442    16 0.656       00005100
''                                                                          00005110
''GPC SWITCH MONITOR    (TASK 37)                                          00005120
''   ARA_GPC_SWITCH                                                         00005130
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005140
 3 118    0    110001     1300         0     10      442    16 0.214       00005150
''                                                                          00005160
''IDLE OPERATIONAL SEQUENCE                                                00005170
''   ARB_IDLE_OPS                                                          00005180
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005190
'' 119    0    110001     600          0     10      442    16 0.038       00005200
''                                                                          00005210
''GPC RECONFIGURATION                                                      00005220
''   ARC_GPC_RECONFIG                                                       00005230
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005240
'' 120    0    110001     2280         0     10      442    16 0.384       00005250
''                                                                          00005260
''BUS CONFIGURATION CHANGE                                                 00005270
''   ARD_BUS_CHG                                                           00005280
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005290
'' 121    0    110001     5200         0     10      442    16 0.192       00005300
''                                                                          00005310
''GPC RECONFIGURATION TABLE CHANGE                                         00005320
''   ARE_GPC_TABLE_CHG                                                      00005330
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005340
'' 122    0    110001     480          0     10      442    16 0.13        00005350
''                                                                          00005360
''DPS CONFIGURATION ITEM PROCESSOR                                         00005370
''   ARF_DPS_CONFIG_ITEM                                                    00005380
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005390
'' 123    0    110001     1000         0     10      442    16 0.072       00005400
''                                                                          00005410
''GPC RECONFIGURATION MESSAGE HANDLER                                      00005420
''   ARG_RECONFIG_MSG                                                       00005430
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005440
'' 124    1    110001     500          0     10      442    16 0.048       00005450
''                                                                          00005460
''SECONDARY GPC RECONFIGURATION                                            00005470
''   ARH_SEC_GPC_RECONFIG                                                   00005480
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005490
'' 125    1    110001     1000         0     10      442    16 0.307       00005500
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''                                                                          00005510
''READ/WRITE SPECIALIST FUNCTION                                            00005520
''   ASB_RD/WRT                                                             00005530
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005540
'' 127    0    110001     1100         0     10      442   16 0.115       00005550
''                                                                          00005560
''TIME MANAGEMENT SPECIALIST FUNCTION                                       00005570
''   ASC_TIME_MGMT                                                          00005580
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005590
'' 128    0    110001      800         0     10      442   16 0.0864      00005600
''                                                                          00005610
''DATA CONTROL SPECIALIST FUNCTION                                          00005620
''   ASD_DATA_CONTROL                                                       00005630
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005640
'' 129    0    110001     1120         0     10      442   16 0.104       00005650
''                                                                          00005660
''GPC DOWNLIST FORMATTER   (TASK 7)                                         00005670
''   DCD_DOWNLIST                                                          00005680
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005690
'' 130    0    110001     2000         0     10      442   16 0.24        00005700
''                                                                          00005710
''GPC/PCMMU DATA CYCLE SYNCHRONIZER   (TASK 38)                            00005720
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005730
'' 134    0    110001      320         0     10      442   364 0.215      00005740
''                                                                          00005750
''GPC DOWNLIST DATA CONTROLS PROCESSOR   (TASK 36)                          00005760
''   DDC_DWN_LST_CONTROLS                                                   00005770
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005780
'' 135    0    110001      320         0     10      442   364 0.3        00005790
''                                                                          00005800
''LDB I/O PROCESSOR   (TASK 33)                                             00005810
''   DGI_LDB_IO                                                             00005820
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005830
'' 136    1    110001     3040         0     10      442   16 0.24        00005840
''                                                                          00005850
''LDB OUTPUT MESSAGE COORDINATOR                                            00005860
''   DGO_LDB_COORD                                                          00005870
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005880
'' 137    1    110001      840         0     10      442   16 0.048       00005890
''                                                                          00005900
''ICC MESSAGE COLLECTOR   (TASK 7)                                          00005910
''   DIM_ICC_COLLECTOR                                                      00005920
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005930
'' 138    1    110001      940         0     10      442   16 0.323       00005940
''                                                                          00005950
''DISPLAY PRESENTATION AND CONTROL                                          00005960
''   DIS_PLAY                                                               00005970
''      SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME      00005980
'' 139    1    110001      920         0     10      442   16 0.053       00005990
''                                                                          00006000
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''LIGHTS AND ALARM PROCESSING    (TASK 7)                                    00006010
''   DLA_LIGHT_ALARM_PROC                                                    00006020
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00006030
 3 140    1    110001     1600          0     10       442   430 0.24 10    00006040
''                                                                          00006050
''LDB MESSAGE ROUTER    (TASK 33)                                           00006060
''   DLM_LDB_ROUT                                                           00006070
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00006080
'' 141    1    110001      840          0     10       442   16 0.144       00006090
''                                                                          00006100
''ICC MESSAGE ROUTER    (TASK 7)                                            00006110
''   DME_ICC_ROUT                                                           00006120
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00006130
 3 147    1    110001     1260          0     10       442   16 0.087       00006140
''                                                                          00006150
''MCDS INPUT PROCESSOR    (TASK 32)                                         00006160
''   DMI_MCDS_IN                                                            00006170
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00006180
 3 148    0    110001      400          0     10       442   16 0.18        00006190
''                                                                          00006200
''MCDS MESSAGE PROCESSOR  (TASKS 32, 33)                                    00006210
''   DMM_MCDS_PROCESS                                                       00006220
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00006230
 3 149    1    110001     2200          0     10       442   432            00006240
''                                                                          00006250
''FAULT MESSAGE SCAN    (TASK 7)                                            00006260
''   DMS_FMS                                                                00006270
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00006280
 3 151    1    110001      480          0     10       442  429 0.216 10    00006290
''                                                                          00006300
''MESSAGE LINE SUPPORT FUNCTION                                             00006310
''ASSUME IMPLICIT IN APPLICATION CONTROL SEGMENTS                           00006320
''   DMS_MSG_LSF                                                            00006330
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00006340
'' 152    1    110001     3800          0     10       442   16 0.096       00006350
''                                                                          00006360
''APPLICATION MODING AND SEQUENCING                                         00006370
''   DNX_BMS                                                                00006380
''ASSUME IMPLICIT IN APPLICATION CONTROL SEGMENTS                           00006390
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00006400
'' 153    1    110001     1000          0     10       442   16 0.096       00006410
''                                                                          00006420
''TIME HOMOGENEOUS DATA REQUEST PROCESSOR                                   00006430
''   DTH_TIME_HOMO                                                          00006440
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00006450
'' 154    1    110001      300          0     10       442   16 0.144       00006460
''                                                                          00006470
''SYSTEMS MANAGEMENT DATA ACQUISITION (TASK 11)                             00006480
''   SDA_DATA_ACQUISITION                                                   00006490
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00006500
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 3 155   1    110001        1          0     10       442   386    0      00006510
''                                                                        00006520
''SUBSYSTEM CONFIGURATION MONITORING (TASKS 13, 14)                       00006530
''   SPM_SUBSYS_CONFIG_MON                                                00006540
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME     00006550
 3 157   1    110001        1          0     10       442    16 0.0456    00006560
''                                                                        00006570
''FLIGHT CONTROL    (TASK 6)                                              00006580
''   GEF_FC_EXEC            FAST CYCLE EXECUTIVE                         00006590
''   GPN_DP_1               DATA PROCESSING 1                            00006600
''   GPO_DP_2               DATA PROCESSING 2                            00006610
''   GPP_CMDS_PROC          COMMANDS PROCESSOR                           00006620
''   GRB_SWITCH_SF          FDI SWITCH SELECTION FILTER                  00006630
''   GCA_PTCH_CE            PITCH CONTROL ELEMENT                        00006640
''   GCB_RY_CE              ROLL/YAW CONTROL ELEMENT                     00006650
''   GCC_BF_CE              BODY FLAP CONTROL ELEMENT                    00006660
''   GCD_ELVTR_AUTO_CE      ELEVATOR AUTO CONTROL ELEMENT                00006670
''   GCE_ELVTR_MD_CE        ELEVATOR MAN-DIR CONTROL ELEMENT             00006680
''   GCF_ELVTR_CAS_CE       ELEVATOR CAS CONTROL ELEMENT                 00006690
''   GCG_ALRN_AUTO_CE       AILERON AUTO CONTROL ELEMENT                 00006700
''   GCH_ALRN_MD_CE         AILERON MAN-DIR CONTROL ELEMENT              00006710
''   GCI_ALRN_CAS_CE        AILERON CAS CONTROL ELEMENT                  00006720
''   GCJ_RDR_AUTO_CE        RUDDER AUTO CONTROL ELEMENT                  00006730
''   GCK_RDR_MD_CE          RUDDER MAN-DIR CONTROL ELEMENT               00006740
''   GCL_RDR_CAS_CE         RUDDER CAS CONTROL ELEMENT                   00006750
''   GCM_NW_CE              NOSEWHEEL CONTROL ELEMENT                    00006760
''   GCQ_SYS_CHKOUT         CHECKOUT                                     00006770
''   GCR_RECON_INIT         RECONFIGURATION & INITIALIZATION             00006780
''   GCS_SCHED_GAINS        SCHEDULE GAINS - CONTROL LAWS                00006790
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME     00006800
 3 301   0    110001        1          0     10       442   350 0        00006810
''                                                                        00006820
''MATED/DROP CONTROL    (TASK 8)                                          00006830
''   GAA_OPS2_MATED_DROP_TST  OPS CONTROL SEGMENT                         00006840
''   GAD_MATE_IDLE            IDLE PROCESSOR                             00006850
''   GME_FLT_ATT              IMU FLIGHT ATTITUDE PROCESSOR              00006860
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME     00006870
 3 302   0    110001        1          0     10       442   361 0        00006880
''                                                                        00006890
''IMU BITE PROCESSING, ACCELEROMETER ACCUMULATOR, & GYRO TORQUING         00006900
''(TASKS 8, 9, 10)                                                       00006910
''   GMB_IMU_BITE                                                        00006920
''   GMC_ACP_ACUM                                                        00006930
''   GMF_GYO_TORQ                                                        00006940
''      SHARE  LIB.DS     SIZE        TIME  PROCSR  MEMORY  COMP.TIME     00006950
 3 303   1    110001        1          0     10       442   362 0        00006960
''                                                                        00006970
''DISPLAYS AND IMU MODING    (TASKS 10, 18)                               00006980
''   GDA_DED_DISP_PROC        DEDICATED DISPLAY PROCESSOR                 00006990
''   GDB_AVVI_AMI_PROC        DEDICATED DISPLAY, AVVI, AMI PROCESSOR      00007000
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''   GDE_ADI_PROC              DEDICATED DISPLAY ADI PROCESSOR          00007010
''   GDF_HSI_PROC              DEDICATED DISPLAY HSI PROCESSOR          00007020
''   GDZ_DISP_PROC             CRT DISPLAY PROCESSOR                    00007030
''   GMN_IMU_MODING            IMU MODING                               00007040
''   GPC_AD_CALC               AIR-DATA CALCULATIONS                    00007050
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME     00007060
 3 304   1    110001       1          0     10       442   390 0        00007070
''                                                                      00007080
''IMU GYRO AND ACCELEROMETER FUNCTIONS   (TASKS 10, 19)                 00007090
''   GMH_ACP_COMP              IMU ACCELEROMETER COMPENSATION           00007100
''   GML_ACP_TRSF              IMU ACCELEROMETER PULSE TRANSFORMATION   00007110
''   GMK_GYO_COMP              IMU GYRO COMPENSATION                    00007120
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME     00007130
 3 305   1    110001       1          0     10       442   16 1.344     00007140
''                                                                      00007150
''NAVIGATION   (TASKS 10, 15)                                           00007160
''   GNA_MLS_MEAS              MSBLS MEASUREMENT PROCESSING             00007170
''   GNB_TACAN_MEAS            TACAN MEASUREMENT PROCESSING             00007180
''   GNC_BARO_ALT              BARO-ALTIMETER MEASUREMENT PROCESSING    00007190
''   GND_RADAR_ALT             RADAR-ALTIMETER MEASUREMENT PROCESSING   00007200
''   GNE_NAV_EXEC              NAVIGATION EXECUTIVE                     00007210
''   GN1_DATA_SNAP             DATA SAVING                              00007220
''   GN3_MEAS_SCHDLR           MEASUREMENT SCHEDULER                    00007230
''   GN7_NAV_FILTER            FILTER                                   00007240
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME     00007250
 3 306   1    110001       1          0     10       442   368 0.15     00007260
''                                                                      00007270
''GUIDANCE   (TASK 10)                                                  00007280
''   GGB_AL_GUID               APPROACH/LANDING GUIDANCE                00007290
''      THE FOLLOWING ARE CONTROLLED VIA GGB                            00007300
''   GGC_P_TRAJ                PITCH TRAJECTORY                         00007310
''   GGD_TRAJ_CAP              TRAJECTORY CAPTURE                       00007320
''   GGE_SGS                   STEEP GLIDESLOPE                         00007330
''   GGF_F_SGS                 FLARE & SHALLOW GLIDESLOPE               00007340
''   GGG_FF                    FINAL FLARE                              00007350
''   GGH_P_SYNC                PITCH SYNCHRONIZATION                    00007360
''   GGI_R_CMD                 ROLL COMMAND                             00007370
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME     00007380
 3 307   1    110001       1          0     10       442   370 0        00007390
''                                                                      00007400
''TAEM NAVIGATION   (TASK 15)                                           00007410
''   GEN_TAEM_NAV_EXEC         CYCLIC EXECUTIVE                         00007420
''   GN2_INFLT_HARDSTAND       INFLIGHT/HARDSTAND UPDATE                00007430
''   GN4_COV_RECONFG           STATE & COVARIANCE RECONFIGURATION       00007440
''   GN5_AVG_G_DP              DOUBLE PRECISION AVERAGE G               00007450
''   GN6_COV_PROP              COVARIANCE MATRIX PROPAGATION            00007460
''     SHARE  LIB.DS     SIZE       TIME  PROCSR  MEMORY  COMP.TIME     00007470
 3 308   1    110001       1          0     10       442   357 0        00007480
''                                                                      00007490
''IMU MAJOR FUNCTIONS   (TASK 19)                                       00007500
```

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''   GMG_MAJ_EXEC          MAJOR CYCLE EXECUTIVE                                  00007510
''   GMI_T_UPDATE          TRANSFORM UPDATE                                       00007520
''   GMJ_TOR_TRSF          TORQUING TRANSFORM                                     00007530
''   GMM_LAT_FUNC          LARGE ANGLE TORQUING                                   00007540
''   GMQ_LSF_FILP          LEAST SQUARES FILTER                                   00007550
''     SHARE  LIB.DS       SIZE        TIME  PROCSR  MEMORY  COMP.TIME          00007560
 3 309   1    110001         1           0     10      442   353 0              00007570
''                                                                              00007580
''IMU ATTITUDE AND NAV-BASE TO CLUSTER TRANSFORMATION   (TASK 20)               00007590
''   GMS_IMU_ATT                                                                00007600
''   GMP_TNB_CL                                                                 00007610
''     SHARE  LIB.DS       SIZE        TIME  PROCSR  MEMORY  COMP.TIME          00007620
 3 310   1    110001         1           0     10      442   354 0              00007630
''                                                                              00007640
''IMU CALIBRATION   (TASK 21)                                                   00007650
''   GMU_HANG_CALA         HANGAR CALIBRATION A                                   00007660
''   GMV_HANG_CALB         HANGAR CALIBRATION B                                   00007670
''   GMT_PFLT_CALA         PREFLIGHT CALIBRATION A                                00007680
''     SHARE  LIB.DS       SIZE        TIME  PROCSR  MEMORY  COMP.TIME          00007690
 3 311   1    110001         1           0     10      442   16 30.0            00007700
''                                                                              00007710
''REDUNDANCY MANAGEMENT   (TASKS 10, 18)                                        00007720
''   GRE_FDIR              FDI SEQUENCER                                          00007730
''      THE FOLLOWING ARE CONTROLLED BY GRE                                     00007740
''   GRF_TRANS_FDIR        TRANSDUCER SEQUENCER                                   00007750
''   GRG_ACT_FDBK_FDIR     ACTUATOR FEEDBACK SEQUENCER                            00007760
''   GRH_SWT_FDIR          SWITCH SEQUENCER                                       00007770
''   GRI_RGA_FDIR          RATE-GYRO SEQUENCER                                    00007780
''   GRJ_AA_FDIR           ACCELEROMETER ASSEMBLY                                 00007790
''   GRK_RA_FDIR           RADAR ALTIMETER                                        00007800
''   GRL_IMU_FDIR          IMU SEQUENCER                                          00007810
''   GRM_ADTA_FDIR         ADTA SEQUENCER                                         00007820
''   GRN_TACAN_FDIR        MSBLS SEQUENCER                                        00007830
''   GRO_MSBLS_FDIR        MSBLS SEQUENCER                                        00007840
''   GRP_BF_FDIR           BODY FLAP SEQUENCER                                    00007850
''     SHARE  LIB.DS       SIZE        TIME  PROCSR  MEMORY  COMP.TIME          00007860
 3 312   1    110001         1           0     10      442   428 0              00007870
''                                                                              00007880
''USER INTERFACE SUPERVISOR   (TASK 34)                                         00007890
''   DMC_SUPER             USER INTERFACE CONTROL SUPERVISOR                      00007900
''   DMC_FUNCTIONS         KEYBOARD FUNCTIONS                                     00007910
''   DMC_APP_INT           APPLICATION CONTROL INTERFACE                          00007920
''   DMC_MCDS_CNT          MCDS DISPLAY CONTROL                                   00007930
''   DMC_APP_KEY_PROCESS   APPLICATION KEYS PROCESSING                            00007940
''   DMC_DISPLAY           DISPLAY COORDINATION                                   00007950
''   DMC_NEW_DISPLAY       NEW DISPLAY PROCESSING                                 00007960
''   DMC_SEQ_REQ_PROC      SEQUENCE REQUEST PROCESSING                            00007970
''   DIM_ICC_COLLECTOR     ICC MSG COLLECTOR                                      00007980
''     SHARE  LIB.DS       SIZE        TIME  PROCSR  MEMORY  COMP.TIME          00007990
 3 313   0    110001       10380         0     10      442   431                00008000
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''                                                                          00008010
''CYCLIC DISPLAY PROCESSING   (TASK 35)                                     00008020
''   DCI#CYC              CYCLIC DISPLAY PROCESSING                         00008030
''   DCI#CON              DATA CONVERSION                                   00008040
''   DCI#FMT              DATA FORMATTING                                   00008050
''     SHARE  LIB.DS      SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00008060
 3 314   0    110001      5252          0     10       442  435 2.06 8.3    00008070
''                                                                          00008080
''MATED DROP, WARMUP, AND RAW DATA PROCESSING   (TASKS 10, 18)             00008090
''   GEM_MATE_DROP_EXEC  MATED/DROP EXECUTIVE                               00008100
''   GGJ_AVG_G_SP        SINGLE PRECISION AVERAGE G                         00008110
''   GGK_USER_PARAM      USER PARAMETERS                                    00008120
''   GPA_ADTA_DATA_PROC  ADTA DATA PROCESSOR                                00008130
''   GPM_MSBL_DATA_PROC  MSBLS DATA PROCESSOR                               00008140
''   GPR_RA_DATA_PROC    RADAR ALTIMETER PROCESSOR                          00008150
''   GPT_TACAN_DATA_PROC TACAN DATA PROCESSOR                               00008160
''   GTM_TACAN_WARMUP    TACAN WARM-UP                                      00008170
''   GTP_MSBLS_WRMUP     MSBLS WARM-UP                                      00008180
''   GTR_RA_WRMUP        RADAR ALTIMETER WARM-UP                            00008190
''     SHARE  LIB.DA      SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00008200
 3 315   0    110001        1           0     10       442   396 0          00008210
''                                                                          00008220
''SYSTEMS MANAGEMENT PERFORMANCE MONITORING (TASKS 12, 13)                  00008230
''   SFD_FAULT_DETECT_ANNUN       FAULT DETECTION & ANNUNCIATION            00008240
''   SPP_PRECON_PROCESS           PRECONDITION PROCESSING                   00008250
''   SSC_SPECIAL_COMP             SPECIAL COMPUTATIONS                      00008260
''   SAS_ANALOG_SCALE             ANALOG SCALING                            00008270
''     SHARE  LIB.DS      SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00008280
 3 316   1    110001        1           0     10       442   425    0       00008290
''                                                                          00008300
''PERFORMANCE MONITORING CONTROL (TASK 12)                                  00008310
''   SPM_PERFORM_MON_CONTROL      PM CONTROL                                00008320
''     SHARE  LIB.DS      SIZE        TIME  PROCSR  MEMORY  COMP.TIME      00008330
 3 317   1    110001        1           0     10       442   387            00008340
''                                                                          00008350
''                                                                          00008360
''**** MESSAGES ***********************************************************00008370
''                                                                          00008380
''     ALL DATA TRANSMISSIONS OF THE DPS ARE REPRESENTED AS MESSAGES.       00008390
''     MESSAGES 1 THROUGH 5 ARE RESERVED FOR THE SIMULATION EXECUTIVE.      00008400
''                                                                          00008410
''READ FROM FF01, FF02, FF03 -                                              00008420
''   ACCELEROMETER ASSEMBLY (ACCLRM)                                        00008430
''   ROTATIONAL HAND CONTROLLER 1 & 2 (LH RHC, RH RHC)                      00008440
''   SPEEDBRAKE THRUST CONTROLLER 1 & 2 (SBTC)                              00008450
''   RUDDER PEDAL TRANSDUCER ASSEMBLY 1 & 2 (RPTA)                          00008460
''   FF MDM DISCRETES                                                       00008470
''     NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T    00008480
 5   6   0     70001    380  16 12 0     16  1 0     1       3             00008490
 5   7   2     50006  70001  16 56 0     16  0 0     0       3             00008500
```

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''                                                                              00008510
''READ FF04 MDM DISCRETES                                                       00008520
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00008530
 5   8    0     70001  60012  16  2 0    16  0 0      1      1             00008540
 5   9    2     50008  70001  16 24 0    16  0 0      0      1             00008550
''                                                                              0000856C
''READ IMU FROM FF01, FF02, FF03                                                00008570
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00008580
 5  10   0     70001    380  16  2 0    16  1 0      1      3             00008590
 5  11   2     50010  70001  16 28 0    16  0 0      0      3             00008600
''                                                                              00008610
''READ FROM FF01 -                                                              00008620
''   FWD ATTACH POINT VOLTAGE (LCA)                                             00008630
''   AIR DATA TRANSDUCER ASSEMBLY (ADTA)                                        00008640
''   MSBLS                                                                      00008650
''   TACAN AND TACAN REGISTER                                                   00008660
''   RADAR ALTIMETER (RAD ALT)                                                  00008670
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00008680
 5  12   0     70001  60009  16 12 0    16  0 0      1      1             00008690
 5  13   2     50012  70001  16 32 0    16  0 0      0      1             00008700
''                                                                              00008710
''READ FROM FF02 -                                                              00008720
''   ADTA                                                                       00008730
''   MSBLS                                                                      00008740
''   TACAN AND TACAN CONTROL REGISTER                                           00008750
''   RAD ALT                                                                    00008760
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00008770
 5  14   0     70001  60010  16 10 0    16  0 0      1      1             00008780
 5  15   2     50014  70001  16 34 0    16  0 0      0      1             00008790
''                                                                              00008800
''READ FROM FF03 -                                                              00008810
''   LCA                                                                        00008820
''   ADTA                                                                       00008830
''   MSBLS                                                                      00008840
''   TACAN AND TACAN CONTROL REGISTER                                           00008850
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00008860
 5  16   0     70001  60011  16 10 0    16  0 0      1      1             00008870
 5  17   2     50016  70001  16 30 0    16  0 0      0      1             00008880
''                                                                              00008890
''READ ADTA FROM FF04                                                           00008900
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00008910
 5  18   0     70001  60012  16  2 0    16  0 0      1      1             00008920
 5  19   2     50018  70001  16 14 0    16  0 0      0      1             00008930
''                                                                              00008940
''READ CLOCK (MTU) FROM FF01, FF02, FF03                                        00008950
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00008960
 5  20   0     70001    380  16  2 0    16  1 0      1      3             00008970
 5  21   2     50020  70001  16 14 0    16  0 0      0      3             00008980
''                                                                              00008990
''READ FROM FA01, FA02, FA03 -                                                  00009000
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''   RATE GYRO ASSEMBLY                                                    00009010
''   FA MDM DISCRETES                                                      00009020
''     NATURE  SOURCE  SINK  LENGTH     INTERVAL   START  TOTAL  SE  T    00009030
 5  22   0     70001    381  16  6 0    16  1 0     1      3              00009040
 5  23   2     50022  70001  16 18 0    16  0 0     0      3              00009050
''                                                                       00009060
''READ FROM FA04                                                         00009070
''   ACTUATOR POSITION FEEDBACKS (ASA)                                   00009080
''   FA MDM DISCRETES                                                    00009090
''     NATURE  SOURCE  SINK  LENGTH     INTERVAL   START  TOTAL  SE  T    00009100
 5  24   0     70001  60016  16  6 0    16  0 0     1      1              00009110
 5  25   2     50024  70001  16 26 0    16  0 0     0      1              00009120
''                                                                       00009130
''READ FROM FA01, FA02 -                                                 00009140
''   AFT ATTACH POINT VOLTAGE (LCA)                                      00009150
''     NATURE  SOURCE  SINK  LENGTH     INTERVAL   START  TOTAL  SE  T    00009160
 5  26   0     70001    381  16  2 0    16  1 0     1      2              00009170
 5  27   2     50026  70001  16 12 0    16  0 0     0      2              00009180
''                                                                       00009190
''ICC FOR REDUNDANT SET                                                  00009200
''     NATURE  SOURCE  SINK  LENGTH     INTERVAL   START  TOTAL  SE  T    00009210
 5  28   0       383    384  16 256 0   16  0 0     0      1              00009220
''                                                                       00009240
''READ DISPLAY FORMAT FROM MASS MEMORY                                   00009250
''NOT USED IN ALT                                                        00009260
''     NATURE  SOURCE  SINK  LENGTH     INTERVAL   START  TOTAL  SE  T    00009270
''  30   0     70001 110002  16    2 0   16  0 0     1      1              00009280
''  31   2     50030  70001  16 1024 0   16  0 0     0      1              00009290
''                                                                       00009300
''READ PERFORMANCE DATA FROM PCMMU                                       00009310
''     NATURE  SOURCE  SINK  LENGTH     INTERVAL   START  TOTAL  SE  T    00009320
 5  32   0     70001   60095  16 256 0   16  1 0     1      1              00009330
 5  33   2     50032   70001  16 256 0   16  0 0     0      1              00009340
''                                                                       00009350
''WRITE TO FF01, FF02, FF03 -                                            00009360
''   TACAN CONTROL REGISTER                                              00009370
''   FF MDM DISCRETES                                                    00009380
''     NATURE  SOURCE  SINK  LENGTH     INTERVAL   START  TOTAL  SE  T    00009390
 5  50   0     70001    380  16 52 0    16  0 0     0      3              00009400
''                                                                       00009410
''WRITE FF MDM DISCRETES TO FF04                                         00009420
''     NATURE  SOURCE  SINK  LENGTH     INTERVAL   START  TOTAL  SE  T    00009430
 5  51   0     70001  60012  16 48 0    16  0 0     0      1              00009440
''                                                                       00009450
''WRITE IMU TO FF01, FF02, FF03                                          00009460
''     NATURE  SOURCE  SINK  LENGTH     INTERVAL   START  TOTAL  SE  T    00009470
 5  52   0     70001    380  16  4 0    16  0 0     0      3              00009480
''                                                                       00009490
''WRITE TO FA01, FA02, FA03, FA04 -                                      00009500
''   AERO SURFACE SERVO AMPLIFIER (ASA)                                  00009510
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''   FA MDM DISCRETES                                                    00009520
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00009530
 5  53   0      70001    381  16 36 0     16  0 0     0      4          00009540
''                                                                      00009550
''WRITE TO DDU1, DDU2 -                                                 00009560
''   AVVI                                                               00009570
''   AMI                                                                00009580
''   ADI                                                                00009590
''   HSI                                                                00009600
''   SPI                                                                00009610
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00009620
 5  54   0      70001    382  16 72 0     16  0 0     0      2          00009630
''                                                                      00009640
''WRITE TO DEU1, 2, AND 3   (TASK 34)                                   00009650
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00009660
 5  55   0      70001  60001  16 1024 0   16  0 0     1      1          00009670
 5  56   0      70001  60002  16 1024 0   16  0 0     1      1          00009680
 5  57   0      70001  60003  16 1024 0   16  0 0     1      1          00009690
''                                                                      00009700
''WRITE PRIME FRAME TO PCMMU                                            00009710
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00009720
 5  58   0      70001  60095  16 512 0    16  0 0     0      1          00009730
''                                                                      00009740
''READ KEYBD 1 AND WRITE NEW DISPLAY TO DEU1                            00009750
''      NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T 00009760
 5  59   0      60027  70001  434  0 0    16  0 0     0      1          00009770
 5  60   2      50059  60001  433  0 0    16  1 0     0      1          00009780
''                                                                      00009790
''                                                                      00009800
''**** DEVICES ********************************************************* 00009810
''                                                                      00009820
''      SYSTEM COMPONENTS WHICH ARE USED AS THE ORIGIN OR TERMINUS FOR   00009830
''      DATA TRANSMISSION ARE REPRESENTED AS DEVICES.                    00009840
''                                                                      00009850
''DISPLAY ELECTRONIC UNIT NO. 1                                         00009860
''       A/D  SHARE     RECORD        TRANSMISSION RATE    RESET       0000987U
''            CLASS     SIZE          INPUT      OUTPUT    PERIOD      00009880
6   1    1      1        8192           120         62       0         00009890
''                                                                      00009900
''DISPLAY ELECTRONIC UNIT NO. 2                                         00009910
''       A/D  SHARE     RECORD        TRANSMISSION RATE    RESET       00009920
''             CLASS     SIZE          INPUT      OUTPUT    PERIOD      00009930
6   2    1      1        8192           120         62       0         00009940
''                                                                      00009950
''DISPLAY ELECTRONIC UNIT NO. 3                                         00009960
''       A/D  SHARE     RECORD        TRANSMISSION RATE    RESET       00009970
''            CLASS     SIZE          INPUT      OUTPUT    PERIOD      00009980
6   3    1      1        8192           120         62       0         00009990
''                                                                      00010000
''DISPLAY ELECTRONIC UNIT NO. 4                                         00010010
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''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010020
''            CLASS     SIZE            INPUT      OUTPUT    PERIOD         00010030
6   4    1      1        8192             120          62      0            00010040
''DISPLAY UNIT NO. 1                                                        00010050
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010060
''            CLASS     SIZE            INPUT      OUTPUT    PERIOD         00010070
6   5    1      1        8192              38           0      0            00010080
''                                                                          00010090
''DISPLAY UNIT NO. 2                                                        00010100
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010110
''            CLASS     SIZE            INPUT      OUTPUT    PERIOD         00010120
6   6    1      1        8192              38           0      0            00010130
''                                                                          00010140
''DISPLAY UNIT NO. 3                                                        00010150
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010160
''            CLASS     SIZE            INPUT      OUTPUT    PERIOD         00010170
6   7    1      1        8192              38           0      0            00010180
''                                                                          00010190
''DISPLAY UNIT NO. 4                                                        00010200
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010210
''            CLASS     SIZE            INPUT      OUTPUT    PERIOD         00010220
6   8    1      1        8192              38           0      0            00010230
''                                                                          00010240
''MULTIPLEXER/DEMULTIPLEXER (MDM) FF1                                       00010250
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010260
''            CLASS     SIZE            INPUT      OUTPUT    PERIOD         00010270
6   9    1      1        1024             120          120     0            00010280
''                                                                          00010290
''MULTIPLEXER/DEMULTIPLEXER (MDM) FF2                                       00010300
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010310
''            CLASS     SIZE            INPUT      OUTPUT    PERIOD         00010320
6   10   1      1        1024             120          120     0            00010330
''                                                                          00010340
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FF3                                      00010350
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010360
''            CLASS     SIZE            INPUT      OUTPUT    PERIOD         00010370
6   11   1      1        1024              120         120     0            00010380
''                                                                          00010390
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FF4                                      00010400
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010410
''            CLASS     SIZE            INPUT      OUTPUT    PERIOD         00010420
6   12   1      1        1024              120         120     0            00010430
''                                                                          00010440
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FA1                                      00010450
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010460
''            CLASS     SIZE            INPUT      OUTPUT    PERIOD         00010470
6   13   1      1        1024              120         120     0            00010480
''                                                                          00010490
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FA2                                      00010500
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET          00010510
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''              CLASS       SIZE            INPUT       OUTPUT    PERIOD        00010520
6   14    1       1         1024              120          120       0         00010530
''                                                                             00010540
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FA3                                         00010550
''        A/D   SHARE      RECORD          TRANSMISSION RATE      RESET        00010560
''              CLASS       SIZE            INPUT       OUTPUT    PERIOD      00010570
6   15    1       1         1024              120          120       0         00010580
''                                                                             00010590
''MULTIPLEXER/DEMULTIPLEXER (MDM)  FA4                                         00010600
''        A/D   SHARE      RECORD          TRANSMISSION RATE      RESET        00010610
''              CLASS       SIZE            INPUT       OUTPUT    PERIOD      00010620
6   16    1       1         1024              120          120       0         00010630
''                                                                             00010640
''DISPLAY DRIVER UNIT (DDU) NO. 1                                              00010650
''        A/D   SHARE      RECORD          TRANSMISSION RATE      RESET        00010660
''              CLASS       SIZE            INPUT       OUTPUT    PERIOD      00010670
6   17    1       1           0               120          120       0         00010680
''                                                                             00010690
''DISPLAY DRIVER UNIT (DDU) NO. 2                                              00010700
''        A/D   SHARE      RECORD          TRANSMISSION RATE      RESET        00010710
''              CLASS       SIZE            INPUT       OUTPUT    PERIOD      00010720
6   18    1       1           0               120          120       0         00010730
''                                                                             00010740
''DISPLAY DRIVER UNIT (DDU) NO. 3                                              00010750
''        A/D   SHARE      RECORD          TRANSMISSION RATE      RESET        00010760
''              CLASS       SIZE            INPUT       OUTPUT    PERIOD      00010770
6   19    1       1           0               120          120       0         00010780
''                                                                             00010790
''MULTIPLEXER/DEMULTIPLEXER (MDM) OF1                                          00010800
''        A/D   SHARE      RECORD          TRANSMISSION RATE      RESET        00010810
''              CLASS       SIZE            INPUT       OUTPUT    PERIOD      00010820
6   20    1       1         1024              120          120       0         00010830
''                                                                             00010840
''MULTIPLEXER/DEMULTIPLEXER (MDM) OF2                                          00010850
''        A/D   SHARE      RECORD          TRANSMISSION RATE      RESET        00010860
''              CLASS       SIZE            INPUT       OUTPUT    PERIOD      00010870
6   21    1       1         1024              120          120       0         00010880
''                                                                             00010890
''MULTIPLEXER/DEMULTIPLEXER (MDM) OF3                                          00010900
''        A/D   SHARE      RECORD          TRANSMISSION RATE      RESET        00010910
''              CLASS       SIZE            INPUT       OUTPUT    PERIOD      00010920
6   22    1       1         1024              120          120       0         00010930
''                                                                             00010940
''MULTIPLEXER/DEMULTIPLEXER (MDM) OF4                                          00010950
''        A/D   SHARE      RECORD          TRANSMISSION RATE      RESET        00010960
''              CLASS       SIZE            INPUT       OUTPUT    PERIOD      00010970
6   23    1       1         1024              120          120       0         00010980
''                                                                             00010990
''MULTIPLEXER/DEMULTIPLEXER (MDM) OA1                                          00011000
''        A/D   SHARE      RECORD          TRANSMISSION RATE      RESET        00011010
```

```
''            CLASS      SIZE          INPUT      OUTPUT    PERIOD        00011020
6   24   1      1        1024            120         120      0          00011030
''                                                                       00011040
''MULTIPLEXER/DEMULTIPLEXER (MDM) OA2                                    00011050
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET       00011060
''            CLASS      SIZE          INPUT      OUTPUT    PERIOD      00011070
6   25   1      1        1024            120         120      0          00011080
''                                                                       00011090
''MULTIPLEXER/DEMULTIPLEXER (MDM) OA3                                    00011100
''       A/D  SHARE     RECORD          TRANSMASSION RATE    RESET       00011110
''            CLASS      SIZE          INPUT      OUTPUT    PERIOD      00011120
6   26   1      1        1024            120         120      0          00011130
''                                                                       00011140
''KEYBOARD UNIT (KBU) NO. 1                                              00011150
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET       00011160
''            CLASS      SIZE          INPUT      OUTPUT    PERIOD      00011170
6   27   1      1          0               0           1      1          00011180
''                                                                       00011190
''KEYBOARD UNIT (KBU) NO. 2                                              00011200
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET       00011210
''            CLASS      SIZE          INPUT      OUTPUT    PERIOD      00011220
6   28   1      1          0               0           1      1          00011230
''                                                                       00011240
''KEYBOARD UNIT (KBU) NO. 3                                              00011250
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET       00011260
''            CLASS      SIZE          INPUT      OUTPUT    PERIOD      00011270
6   29   1      1          0               0           1      1          00011280
''                                                                       00011290
''PULSE CODE MODULATION MASTER UNIT (PCMMU) NO. 1                        00011300
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET       00011310
''            CLASS      SIZE          INPUT      OUTPUT    PERIOD      00011320
6   95   1      1        2048            120         120      0          00011330
''                                                                       00011340
''PULSE CODE MODULATION MASTER UNIT (PCMMU) NO. 2                        00011350
''       A/D  SHARE     RECORD          TRANSMISSION RATE    RESET       00011360
''            CLASS      SIZE          INPUT      OUTPUT    PERIOD      00011370
6   96   1      1        2048            120         120      0          00011380
''                                                                       00011390
''                                                                       00011400
''**** MEMORY UNITS ************************************************** 00011410
''                                                                       00011420
''     THE GPC CORE MEMORIES ARE REPRESENTED AS MEMORY UNITS.            00011430
''                                                                       00011440
''MEMORY GPC 1                                                           00011450
''        SPEED FACTOR          PAGES                                    00011460
7    1        1.4                125                                    00011470
''                                                                       00011480
''MEMORY GPC 2                                                           00011490
''        SPEED FACTOR          PAGES                                    00011500
7    2        1.4                125                                    00011510
```

```
''                                                                      00011520
''MEMORY GPC 3                                                          00011530
''        SPEED FACTOR          PAGES                                   00011540
7    3         1.4                125                                  00011550
''                                                                      00011560
''MEMORY GPC 4                                                          00011570
''        SPEED FACTOR          PAGES                                   00011580
7    4         1.4                125                                  00011590
''                                                                      00011600
''                                                                      00011610
''**** STORAGE UNITS ************************************************* 00011620
''                                                                      00011630
''     MASS MEMORIES ARE REPRESENTED AS STORAGE UNITS.                  00011640
''                                                                      00011650
''MASS MEMORY STORAGE (MM) NO. 1                                        00011660
''          A/D  SHARE  CYCLE  TRX RATE  CAPACITY   ACCESS PERIOD       00011670
8    1      1      1      0      125     17000000   399  500  0  0  0   00011680
''                                                                      00011690
''MASS MEMORY STORAGE (MM) NO. 2                                        00011700
''          A/D  SHARE  CYCLE  TRX RATE  CAPACITY   ACCESS PERIOD       00011710
8    2      1      1      0      125     17000000   399  500  0  0  0   00011720
''                                                                      00011730
''                                                                      00011740
''**** PROCESSORS **************************************************** 00011750
''                                                                      00011760
''     THE CPU OF EACH GPC IS REPRESENTED AS A PROCESSOR.  HOWEVER,     00011770
''     ONE IS ACTUALLY EMPLOYED IN SIMULATING DPS FUNCTION EXECUTION.   00011780
''                                                                      00011790
''CENTRAL PROCESSING UNIT (CPU) NO. 1                                   00011800
''       SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES 00011810
9    1  0.48     10        5         0        1        1                00011820
''                                                                      00011830
''CENTRAL PROCESSING UNIT (CPU) NO. 2                                   00011840
''       SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES 00011850
9    2  0.48     10        5         0        2        2                00011860
''                                                                      00011870
''CENTRAL PROCESSING UNIT (CPU) NO. 3                                   00011880
''       SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES 00011890
9    3  0.48     10        5         0        3        3                00011900
''                                                                      00011910
''CENTRAL PROCESSING UNIT (CPU) NO. 4                                   00011920
''       SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES 00011930
9    4  0.48     10        5         0        4        4                00011940
''                                                                      00011950
''                                                                      00011960
''**** DATA LINKS **************************************************** 00011970
''                                                                      00011980
''     EACH OF THE TRANSMISSION PATHS FOR DATA IN THE DPS IS            00011990
''     REPRESENTED AS A DATA LINK.                                      00012000
''                                                                      00012010
```

```
''INTERCOMPUTER COMMUNICATIONS DATALINK - IC1                    00012020
''          MODE   TRANSMISSION RATE     TIME LAG               00012030
10   1       0        120                  0                    00012040
''                                                              00012050
''INTERCOMPUTER COMMUNICATIONS DATALINK - IC2                    00012060
''          MODE   TRANSMISSION RATE     TIME LAG               00012070
10   2       0        120                  0                    00012080
''                                                              00012090
''INTERCOMPUTER COMMUNICATIONS DATALINK - IC3                    00012100
''          MODE   TRANSMISSION RATE     TIME LAG               00012110
10   3       0        120                  0                    00012120
''                                                              00012130
''INTERCOMPUTER COMMUNICATIONS DATALINK - IC4                    00012140
''          MODE   TRANSMISSION RATE     TIME LAG               00012150
10   4       0        120                  0                    00012160
''                                                              00012170
''INTERCOMPUTER COMMUNICATIONS DATALINK - IC5                    00012180
''          MODE   TRANSMISSION RATE     TIME LAG               00012190
10   5       0        120                  0                    00012200
''                                                              00012210
''DISPLAY SYSTEM DATALINK - DK1                                  00012220
''          MODE   TRANSMISSION RATE     TIME LAG               00012230
10   6       0        120                  0                    00012240
''                                                              00012250
''DISPLAY SYSTEM DATALINK - DK2                                  00012260
''          MODE   TRANSMISSION RATE     TIME LAG               00012270
10   7       0        120                  0                    00012280
''                                                              00012290
''DISPLAY SYSTEM DATALINK - DK3                                  00012300
''          MODE   TRANSMISSION RATE     TIME LAG               00012310
10   8       0        120                  0                    00012320
''                                                              00012330
''DISPLAY SYSTEM DATALINK - DK4                                  00012340
''          MODE   TRANSMISSION RATE     TIME LAG               00012350
10   9       0        120                  0                    00012360
''                                                              00012370
''FLIGHT CRITICAL BUS DATALINK - FC1                             00012380
''          MODE   TRANSMISSION RATE     TIME LAG               00012390
10  10       0        120                  0                    00012400
''                                                              00012410
''FLIGHT CRITICAL BUS DATALINK - FC2                             00012420
''          MODE   TRANSMISSION RATE     TIME LAG               00012430
10   11       0        120                  0                   00012440
''                                                              00012450
''FLIGHT CRITICAL BUS DATALINK - FC3                             00012460
''          MODE   TRANSMISSION RATE     TIME LAG               00012470
10   12       0        120                  0                   00012480
''                                                              00012490
''FLIGHT CRITICAL BUS DATALINK - FC4                             00012500
''          MODE   TRANSMISSION RATE     TIME LAG               00012510
```

```
10   13       0        120                0                          00012520
''                                                                    00012530
''FLIGHT CRITICAL BUS DATALINK - FC5                                  00012540
''          MODE   TRANSMISSION RATE     TIME LAG                     00012550
10   14       0        120                0                          00012560
''                                                                    00012570
''FLIGHT CRITICAL BUS DATALINK - FC6                                  00012580
''          MODE   TRANSMISSION RATE     TIME LAG                     00012590
10   15       0        120                0                          00012600
''                                                                    00012610
''FLIGHT CRITICAL BUS DATALINK - FC7                                  00012620
''          MODE   TRANSMISSION RATE     TIME LAG                     00012630
10   16       0        120                0                          00012640
''                                                                    00012650
''FLIGHT CRITICAL BUS DATALINK - FC8                                  00012660
''          MODE   TRANSMISSION RATE     TIME LAG                     00012670
10   17       0        120                0                          00012680
''                                                                    00012690
''MASS MEMORY DATALINK - MM1                                          00012700
''          MODE   TRANSMISSION RATE     TIME LAG                     00012710
10   18       0        120              500                          00012720
''                                                                    00012730
''MASS MEMORY DATALINK - MM2                                          00012740
''          MODE   TRANSMISSION RATE     TIME LAG                     00012750
10   19       0        120              500                          00012760
''                                                                    00012770
''MISSION CRITICAL DATALINK - PL1                                     00012780
''          MODE   TRANSMISSION RATE     TIME LAG                     00012790
10   20       0        120                0                          00012800
''                                                                    00012810
''MISSION CRITICAL DATALINK - PL2                                     00012820
''          MODE   TRANSMISSION RATE     TIME LAG                     00012830
10   21       0        120                0                          00012840
''                                                                    00012850
''GROUND INTERFACE DATALINK - LB1                                     00012860
''          MODE   TRANSMISSION RATE     TIME LAG                     00012870
10   22       0        120                0                          00012880
''                                                                    00012890
''GROUND INTERFACE DATALINK - LB2                                     00012900
''          MODE   TRANSMISSION RATE     TIME LAG                     00012910
10   23       0        120                0                          00012920
''                                                                    00012930
''PCMMU DATALINK - IP1                                                00012940
''          MODE   TRANSMISSION RATE     TIME LAG                     00012950
10   24       0        120                0                          00012960
''                                                                    00012970
''PCMMU DATALINK - IP2                                                00012980
''          MODE   TRANSMISSION RATE     TIME LAG                     00012990
10   25       0        120                0                          00013000
''                                                                    00013010
```

```
''PCMMU DATALINK - IP3                                                  00013020
''          MODE   TRANSMISSION RATE     TIME LAG                     00013030
10   26       0          120                 0                        00013040
''                                                                      00013050
''PCMMU DATALINK - IP4                                                  00013060
''          MODE   TRANSMISSION RATE     TIME LAG                     00013070
10   27       0          120                 0                        00013080
''                                                                      00013090
''DU1/DEU1 DATALINK                                                     00013100
''          MODE   TRANSMISSION RATE     TIME LAG                     00013110
10   28       0            1                 0                        00013120
''                                                                      00013130
''DU2/DEU2 DATALINK                                                     00013140
''          MODE   TRANSMISSION RATE     TIME LAG                     00013150
10   29       0            1                 0                        00013160
''                                                                      00013170
''DU3/DEU3 DATALINK                                                     00013180
''          MODE   TRANSMISSION RATE     TIME LAG                     00013190
10   30       0            1                 0                        00013200
''                                                                      00013210
''DU4/DEU4 DATALINK                                                     00013220
''          MODE   TRANSMISSION RATE     TIME LAG                     00013230
10   31       0            1                 0                        00013240
''                                                                      00013250
''KB1/DEU1 DATALINK                                                     00013260
''          MODE   TRANSMISSION RATE     TIME LAG                     00013270
10   32       0            1                 0                        00013280
''                                                                      00013290
''KB1/DEU3 DATALINK                                                     00013300
''          MODE   TRANSMISSION RATE     TIME LAG                     00013310
10   33       0            1                 0                        00013320
''                                                                      00013330
''KB2/DEU2 DATALINK                                                     00013340
''          MODE   TRANSMISSION RATE     TIME LAG                     00013350
10   34       0            1                 0                        00013360
''                                                                      00013370
''KB2/DEU3 DATALINK                                                     00013380
''          MODE   TRANSMISSION RATE     TIME LAG                     00013390
10   35       0            1                 0                        00013400
''                                                                      00013410
''KB3/DEU4 DATALINK                                                     00013420
''          MODE   TRANSMISSION RATE     TIME LAG                     00013430
10   36       0            1                 0                        00013440
''                                                                      00013450
''PCM1/INSTRUMENTATION DATALINK                                         00013460
''          MODE   TRANSMISSION RATE     TIME LAG                     00013470
10   37       0          100                 0                        00013480
''                                                                      00013490
''PCM2/INSTRUMENTATION DATALINK                                         00013500
''          MODE   TRANSMISSION RATE     TIME LAG                     00013510
```

```
10   38       0          100                    0                                  00013520
''                                                                                 00013530
''                                                                                 00013540
''**** DATA SETS ************************************************************** 00013550
''                                                                                 00013560
''     A DATA SET IS DEFINED TO REPRESENT THE DISPLAY IMAGES STORED IN             00013570
''     EACH OF THE TWO MASS MEMORIES.                                              00013580
''                                                                                 00013590
''     STORAGE    ORG    INIT.SIZE    MAX.SIZE                                    00013600
''                                                                                 00013610
11   1    1        0         10000        10000                                   00013620
11   2    1        0         10240        10240                                   00013630
''                                                                                 00013640
''                                                                                 00013650
''**** SYSTEM CONFIGURATION ************************************************** 00013660
''                                                                                 00013670
''     THE FOLLOWING FORMS DEFINE THE INTERCONNECTIONS OF DPS COMPONENTS00013680
''     THROUGH DATA LINKS.                                                         00013690
''                                                                                 00013700
''      UNIT      DATALINK CONNECTIONS                                           00013710
12     60001      6  28  32  33                                                  00013720
12     60002      7  29  34  35                                                  00013730
12     60003      8  30  33  35                                                  00013740
12     60004      9  31  36                                                      00013750
12     60005     28                                                             00013760
12     60006     29                                                             00013770
12     60007     30                                                             00013780
12     60008     31                                                             00013790
12     60009     10  14                                                         00013800
12     60010     11  15                                                         00013810
12     60011     12  16                                                         00013820
12     60012     13  17                                                         00013830
12     60013     14  10                                                         00013840
12     60014     15  11                                                         00013850
12     60015     16  12                                                         00013860
12     60016     17  13                                                         00013870
12     60017     10  11  12  13                                                 00013880
12     60018     10  11  12  13                                                 00013890
12     60019     10  11  12  13                                                 00013900
12     60020     37  38                                                         00013910
12     60021     37  38                                                         00013920
12     60022     37  38                                                         00013930
12     60023     37  38                                                         00013940
12     60024     37  38                                                         00013950
12     60025     37  38                                                         00013960
12     60026     37  38                                                         00013970
12     60027     32  33                                                         00013980
12     60028     34  35                                                         00013990
12     60029     36                                                             00014000
12     60095     24  25  26  27  37                                             00014010
```

```
12      60096      24  25  26  27  38                                                    00014020
12      70001       1   2   3   4   5   6   7   8   9  10  11  12  13   *  00014030
                   14  15  16  17  18  19  20  21  22  23  24                        00014040
12      70002       1   2   3   4   5   6   7   8   9  10  11  12  13   *  00014050
                   14  15  16  17  18  19  20  21  22  23  25                        00014060
12      70003       1   2   3   4   5   6   7   8   9  10  11  12  13   *  00014070
                   14  15  16  17  18  19  20  21  22  23  26                        00014080
12      70004       1   2   3   4   5   6   7   8   9  10  11  12  13   *  00014090
                   14  15  16  17  18  19  20  21  22  23  27                        00014100
12      80001      18                                                               00014110
12      80002      19                                                               00014120
''                                                                                  00014130
''                                                                                  00014140
''**** ALGORITHM SELECTION ***************************************************** 00014150
''                                                                                  00014160
''     1A  1B  2A  2B  2C  2D  2E  3A  3B  3C  4A  4B  5A  5B  6A                   00014170
13      1   0   1   1   0   0   0   1   1   1   1   1   0   0   0                   00014180
''                                                                                  00014190
''                                                                                  00014200
''**** VIRTUAL MACHINES ********************************************************* 00014210
''                                                                                  00014220
''     ONLY ONE VIRTUAL MACHINE IS NEEDED TO REPRESENT THE DPS FOR THE              00014230
''     PURPOSE OF THE CURRENT LOADING STUDY.  HOWEVER, THREE ADDITIONAL             00014240
''     VM'S ARE INCLUDED TO DEMONSTRATE A REDUNDANT SET OF FOUR                     00014250
''     GPC'S.                                                                       00014260
''                                                                                  00014270
''          EXECUTIVE MEM     VM SIZE        VM PAGE SIZE                          00014280
14      1          1          1024000            2048                              00014290
14      2          2          1024000            2048                              00014300
14      3          3          1024000            2048                              00014310
14      4          4          1024000            2048                              00014320
END OF DATA
```

The values listed on the preceding pages in this appendix for NASA.SPECS20.DATA can also be used for the simulation with one Virtual Machine and the IMSIM specification forms NASA.SPECS10.DATA, with the following exceptions:

```
''
''AIE_SIP   SYSTEM SOFTWARE INTERFACE PROCESSOR
''SCHEDULED AT 40MS INTERVALS BY SYSTEM INITIALIZATION
''        CLASS    DELAY     REQUIRED ELEMENTS
 2   7      1        0       30116  30130  30138  30147  50028  50029 *
                             50058  30 51  30140  1


''
''ICC FOR REDUNDANT SET (GPC 2, 3, AND 4 COMMUNICATION WITH GPC 1)
''     NATURE  SOURCE  SINK  LENGTH      INTERVAL   START  TOTAL  SE  T
 5  28   0       383  70001  16 256 0    16  0 0      0      3
 5  29   0     70001    384  16 256 0    16  0 0      0      3
''


''
''CENTRAL PROCESSING UNIT (CPU) NO. 1
''       SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
9    1  0.48    10        5         0       1        1  2  3  4
''
''CENTRAL PROCESSING UNIT (CPU) NO. 2
''       SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
''   2  0.48    10        5         0       1        2  1  3  4
''
''CENTRAL PROCESSING UNIT (CPU) NO. 3
''       SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
''   3  0.48    10        5         0       1        3  1  2  4
''
''CENTRAL PROCESSING UNIT (CPU) NO. 4
''       SPEED  CLASS  INTERRUPT  SWITCH  VIRT MACH  CONNECTED MEMORIES
''   4  0.48    10        5         0       1        4  1  2  3
''
```

APPENDIX C

HISTORY PRINTOUT

This appendix provides the History Printout of a simulation run with jobschedule JSCA07.

The abbreviations used in this appendix, in order of appearance, are as follows:

TUS - Time Units
TS - Task Starts
TI - Task Index (internal IMSIM index)
T X - Task in Execution
MS - Message Starts
M E - Message Ends
T W - Task in Wait state
T E - Task Ends

This printout gives the full history of the run by providing pertinent information at every time that an activity in the model takes place. This history specifies, at the time indicated, one or more of the following types of summaries:

a. The start and finish of jobs.

b. The start, execution, wait, and completion times of tasks, and the appropriate job number for which this task is called.

c. For messages, the task and job number as well as the message length, transmission rate, transmission path consisting of the origin (source), bus or datalink used for transmission, and the destination (sink).

At time 1, the Executive Functions are initialized, while at time 31095, the 20 functions (tasks) for job 2 are initiated. All functions are activated at time 32000, after which the printout provides the history of all events.

```
    1 TUS          START  AT      0   SEC.  JOB      1
    1 TUS    TS    START        TASK      1  JOB      1 TI=701
    1 TUS    TS    START        TASK      2  JOB      1 TI=702
    1 TUS    TS    START        TASK      3  JOB      1 TI=703
    1 TUS    TS    START        TASK      4  JOB      1 TI=704
    1 TUS    TS    START        TASK      5  JOB      1 TI=705
31095 TUS          START  AT    31.09SEC.  JOB      2
31095 TUS    TS    START        TASK      6  JOB      2 TI=706
31095 TUS    TS    START        TASK      7  JOB      2 TI=707
31095 TUS    TS    START        TASK      8  JOB      2 TI=708
31095 TUS    TS    START        TASK      9  JOB      2 TI=709
31095 TUS    TS    START        TASK     10  JOB      2 TI=710
31095 TUS    TS    START        TASK     11  JOB      2 TI=711
31095 TUS    TS    START        TASK     12  JOB      2 TI=712
31095 TUS    TS    START        TASK     13  JOB      2 TI=713
31095 TUS    TS    START        TASK     14  JOB      2 TI=714
31095 TUS    TS    START        TASK     15  JOB      2 TI=715
31095 TUS    TS    START        TASK     19  JOB      2 TI=716
31095 TUS    TS    START        TASK     20  JOB      2 TI=717
31095 TUS    TS    START        TASK     21  JOB      2 TI=718
31095 TUS    TS    START        TASK     22  JOB      2 TI=719
31095 TUS    TS    START        TASK     23  JOB      2 TI=720
31095 TUS    TS    START        TASK     24  JOB      2 TI=721
31095 TUS    TS    START        TASK     32  JOB      2 TI=722
31095 TUS    TS    START        TASK     34  JOB      2 TI=723
31095 TUS    TS    START        TASK     35  JOB      2 TI=724
31095 TUS    TS    START        TASK     37  JOB      2 TI=725
32001 TUS    T X   EXECUTING    TASK      7  JOB      2 TI=707
32001 TUS MS       START  28    TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70004          1       70001              256   120
32001 TUS MS       START  29    TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001          2       70004              256   120
32001 TUS MS       START  58    TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001         24       60095              512   120
32003 TUS M E      END    28    TASK      7  JOB      2 TI=707
32003 TUS M E      END    29    TASK      7  JOB      2 TI=707
32003 TUS    T   W MSG WAIT     TASK      7  JOB      2 TI=707
32003 TUS    T X   EXECUTING    TASK      6  JOB      2 TI=706
32003 TUS MS       START  50    TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001         12       60011               52   120
32003 TUS M E      END    50    TASK      6  JOB      2 TI=706
32003 TUS MS       START  51    TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001         13       60012               48   120
32003 TUS M E      END    51    TASK      6  JOB      2 TI=706
32003 TUS MS       START  52    TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001         12       60011                4   120
32003 TUS M E      END    52    TASK      6  JOB      2 TI=706
32003 TUS MS       START  53    TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001         13       60016               36   120
32003 TUS M E      END    53    TASK      6  JOB      2 TI=706
32003 TUS MS       START  54    TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001         10       60018               72   120
32003 TUS M E      END    54    TASK      6  JOB      2 TI=706
32003 TUS MS       START   6    TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001         12       60011               12   120
32003 TUS M E      END     6    TASK      6  JOB      2 TI=706
32003 TUS MS       START   8    TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001         13       60012                2   120
32003 TUS M E      END     8    TASK      6  JOB      2 TI=706
32003 TUS MS       START  10    TASK      6  JOB      2 TI=706 LENGTH  RATE
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                PATH  70001      12      60011                2   120
32003 TUS M E   END    10 TASK      6 JOB      2 TI=706
32003 TUS MS    START  12 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  70001      10      60009               12   120
32003 TUS M E   END    12 TASK      6 JOB      2 TI=706
32003 TUS MS    START  14 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  70001      11      60010               10   120
32003 TUS M E   END    14 TASK      6 JOB      2 TI=706
32003 TUS MS    START  16 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  70001      12      60011               10   120
32003 TUS M E   END    16 TASK      6 JOB      2 TI=706
32003 TUS MS    START  18 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  70001      13      60012                2   120
32003 TUS M E   END    18 TASK      6 JOB      2 TI=706
32003 TUS MS    START  20 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  70001      12      60011                2   120
32003 TUS M E   END    20 TASK      6 JOB      2 TI=706
32003 TUS MS    START  22 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  70001      12      60015                6   120
32003 TUS M E   END    22 TASK      6 JOB      2 TI=706
32003 TUS MS    START  24 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  70001      13      60016                6   120
32003 TUS M E   END    24 TASK      6 JOB      2 TI=706
32003 TUS MS    START  26 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  70001      11      60014                2   120
32003 TUS M E   END    26 TASK      6 JOB      2 TI=706
32003 TUS MS    START   7 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60011      12      70001               56   120
32003 TUS M E   END     7 TASK      6 JOB      2 TI=706
32003 TUS MS    START   9 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60012      13      70001               24   120
32003 TUS M E   END     9 TASK      6 JOB      2 TI=706
32003 TUS MS    START  11 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60011      12      70001               28   120
32003 TUS M E   END    11 TASK      6 JOB      2 TI=706
32003 TUS MS    START  13 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60009      10      70001               32   120
32003 TUS M E   END    13 TASK      6 JOB      2 TI=706
32003 TUS MS    START  15 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60010      11      70001               34   120
32003 TUS M E   END    15 TASK      6 JOB      2 TI=706
32003 TUS MS    START  17 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60011      12      70001               30   120
32003 TUS M E   END    17 TASK      6 JOB      2 TI=706
32003 TUS MS    START  19 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60012      13      70001               14   120
32003 TUS M E   END    19 TASK      6 JOB      2 TI=706
32003 TUS MS    START  21 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60011      12      70001               14   120
32003 TUS M E   END    21 TASK      6 JOB      2 TI=706
32003 TUS MS    START  23 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60015      12      70001               18   120
32003 TUS M E   END    23 TASK      6 JOB      2 TI=706
32003 TUS MS    START  25 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60016      13      70001               26   120
32003 TUS M E   END    25 TASK      6 JOB      2 TI=706
32003 TUS MS    START  27 TASK      6 JOB      2 TI=706 LENGTH  RATE
                PATH  60014      11      70001               12   120
32003 TUS M E   END    27 TASK      6 JOB      2 TI=706
32005 TUS M E   END    58 TASK      7 JOB      2 TI=707
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32005 TUS     T     I INTERRUPT  TASK        6  JOB       2 TI=706
32005 TUS     T X     EXECUTING  TASK        7  JOB       2 TI=707
32005 TUS MS          START  28  TASK        7  JOB       2 TI=707 LENGTH  RATE
                      PATH  70003          1       70001              256   120
32005 TUS MS          START  29  TASK        7  JOB       2 TI=707 LENGTH  RATE
                      PATH  70001          2       70003              256   120
32007 TUS M E         END    28  TASK        7  JOB       2 TI=707
32007 TUS M E         END    29  TASK        7  JOB       2 TI=707
32007 TUS MS          START  28  TASK        7  JOB       2 TI=707 LENGTH  RATE
                      PATH  70002          1       70001              256   120
32007 TUS MS          START  29  TASK        7  JOB       2 TI=707 LENGTH  RATE
                      PATH  70001          2       70002              256   120
32009 TUS M E         END    28  TASK        7  JOB       2 TI=707
32009 TUS M E         END    29  TASK        7  JOB       2 TI=707
32009 TUS     T   E   END        TASK        7  JOB       2 TI=707
32009 TUS     T X     EXECUTING  TASK        6  JOB       2 TI=706
32014 TUS MS          START  50  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         11       60010               52   120
32014 TUS M E         END    50  TASK        6  JOB       2 TI=706
32014 TUS MS          START  52  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         11       60010                4   120
32014 TUS M E         END    52  TASK        6  JOB       2 TI=706
32014 TUS MS          START  53  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         12       60015               36   120
32014 TUS M E         END    53  TASK        6  JOB       2 TI=706
32014 TUS MS          START  54  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         10       60017               72   120
32014 TUS M E         END    54  TASK        6  JOB       2 TI=706
32014 TUS MS          START   6  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         11       60010               12   120
32014 TUS M E         END     6  TASK        6  JOB       2 TI=706
32014 TUS MS          START  10  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         11       60010                2   120
32014 TUS M E         END    10  TASK        6  JOB       2 TI=706
32014 TUS MS          START  20  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         11       60010                2   120
32014 TUS M E         END    20  TASK        6  JOB       2 TI=706
32014 TUS MS          START  22  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         11       60014                6   120
32014 TUS M E         END    22  TASK        6  JOB       2 TI=706
32014 TUS MS          START  26  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         10       60013                2   120
32014 TUS M E         END    26  TASK        6  JOB       2 TI=706
32014 TUS MS          START  50  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         10       60009               52   120
32014 TUS M E         END    50  TASK        6  JOB       2 TI=706
32014 TUS MS          START  52  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         10       60009                4   120
32014 TUS M E         END    52  TASK        6  JOB       2 TI=706
32014 TUS MS          START  53  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  70001         11       60014               36   120
32014 TUS M E         END    53  TASK        6  JOB       2 TI=706
32014 TUS MS          START   7  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  60010         11       70001               56   120
32014 TUS M E         END     7  TASK        6  JOB       2 TI=706
32014 TUS MS          START  11  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  60010         11       70001               28   120
32014 TUS M E         END    11  TASK        6  JOB       2 TI=706
32014 TUS MS          START  21  TASK        6  JOB       2 TI=706 LENGTH  RATE
                      PATH  60010         11       70001               14   120
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32014 TUS M E      END    21  TASK      6  JOB      2 TI=706
32014 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014      11       70001              18   120
32014 TUS M E      END    23  TASK      6  JOB      2 TI=706
32014 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60013      10       70001              12   120
32014 TUS M E      END    27  TASK      6  JOB      2 TI=706
32014 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60013              36   120
32014 TUS M E      END    53  TASK      6  JOB      2 TI=706
32015 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60009              12   120
32015 TUS M E      END     6  TASK      6  JOB      2 TI=706
32015 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60009               2   120
32015 TUS M E      END    10  TASK      6  JOB      2 TI=706
32015 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60009               2   120
32015 TUS M E      END    20  TASK      6  JOB      2 TI=706
32015 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60013               6   120
32015 TUS M E      END    22  TASK      6  JOB      2 TI=706
32015 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10       70001              56   120
32015 TUS M E      END     7  TASK      6  JOB      2 TI=706
32015 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10       70001              28   120
32015 TUS M E      END    11  TASK      6  JOB      2 TI=706
32015 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10       70001              14   120
32015 TUS M E      END    21  TASK      6  JOB      2 TI=706
32015 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60013      10       70001              18   120
32015 TUS M E      END    23  TASK      6  JOB      2 TI=706
32015 TUS    T  E  END         TASK      6  JOB      2 TI=706
32015 TUS    T X   EXECUTING   TASK      9  JOB      2 TI=709
32017 TUS    T  E  END         TASK      9  JOB      2 TI=709
32017 TUS    T X   EXECUTING   TASK     32  JOB      2 TI=722
32018 TUS    T X   EXECUTING   TASK     11  JOB      2 TI=711
32018 TUS    T  E  END         TASK     32  JOB      2 TI=722
32018 TUS MS       START  32  TASK      11  JOB      2 TI=711 LENGTH  RATE
                   PATH  70001      24       60095             256   120
32020 TUS M E      END    32  TASK      11  JOB      2 TI=711
32020 TUS    T X   EXECUTING   TASK     14  JOB      2 TI=714
32020 TUS MS       START  33  TASK      11  JOB      2 TI=711 LENGTH  RATE
                   PATH  60095      24       70001             256   120
32020 TUS    T   W MSG WAIT    TASK     11  JOB      2 TI=711
32020 TUS    T  E  END         TASK     14  JOB      2 TI=714
32020 TUS    T X   EXECUTING   TASK     10  JOB      2 TI=710
32022 TUS M E      END    33  TASK      11  JOB      2 TI=711
32022 TUS    T    I INTERRUPT  TASK     10  JOB      2 TI=710
32022 TUS    T X   EXECUTING   TASK     11  JOB      2 TI=711
32022 TUS    T  E  END         TASK     11  JOB      2 TI=711
32022 TUS    T X   EXECUTING   TASK     10  JOB      2 TI=710
32031 TUS    T  E  END         TASK     10  JOB      2 TI=710
32031 TUS    T X   EXECUTING   TASK     34  JOB      2 TI=723
32034 TUS    T  E  END         TASK     34  JOB      2 TI=723
32034 TUS    T X   EXECUTING   TASK     35  JOB      2 TI=724
32034 TUS MS       START  55  TASK      35  JOB      2 TI=724 LENGTH  RATE
                   PATH  70001       6       60001             1024   120
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32034 TUS MS        START  56  TASK     35  JOB      2 TI=724 LENGTH  RATE
                    PATH  70001       7       60002              1024   120
32034 TUS MS        START  57  TASK     35  JOB      2 TI=724 LENGTH  RATE
                    PATH  70001       8       60003              1024   120
32041 TUS    T    I INTERRUPT  TASK     35  JOB      2 TI=724
32041 TUS    T X   EXECUTING  TASK      7  JOB      2 TI=707
32041 TUS MS        START  58  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001      24       60095               512   120
32041 TUS MS        START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70004       1       70001               256   120
32041 TUS MS        START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001       2       70004               256   120
32042 TUS M E       END    55  TASK     35  JOB      2 TI=724
32042 TUS M E       END    56  TASK     35  JOB      2 TI=724
32042 TUS M E       END    57  TASK     35  JOB      2 TI=724
32043 TUS M E       END    28  TASK      7  JOB      2 TI=707
32043 TUS M E       END    29  TASK      7  JOB      2 TI=707
32043 TUS    T   W  MSG WAIT  TASK      7  JOB      2 TI=707
32043 TUS    T X    EXECUTING  TASK      6  JOB      2 TI=706
32043 TUS MS        START  51  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012                48   120
32043 TUS M E       END    51  TASK      6  JOB      2 TI=706
32043 TUS MS        START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60018                72   120
32043 TUS M E       END    54  TASK      6  JOB      2 TI=706
32043 TUS MS        START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011                52   120
32043 TUS M E       END    50  TASK      6  JOB      2 TI=706
32043 TUS MS        START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011                 4   120
32043 TUS M E       END    52  TASK      6  JOB      2 TI=706
32043 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60016                36   120
32043 TUS M E       END    53  TASK      6  JOB      2 TI=706
32043 TUS MS        START   8  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012                 2   120
32043 TUS M E       END     8  TASK      6  JOB      2 TI=706
32043 TUS MS        START  12  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009                12   120
32043 TUS M E       END    12  TASK      6  JOB      2 TI=706
32043 TUS MS        START  14  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60010                10   120
32043 TUS M E       END    14  TASK      6  JOB      2 TI=706
32043 TUS MS        START  16  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011                10   120
32043 TUS M E       END    16  TASK      6  JOB      2 TI=706
32043 TUS MS        START  18  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012                 2   120
32043 TUS M E       END    18  TASK      6  JOB      2 TI=706
32043 TUS MS        START  24  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60016                 6   120
32043 TUS M E       END    24  TASK      6  JOB      2 TI=706
32043 TUS MS        START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60014                 2   120
32043 TUS M E       END    26  TASK      6  JOB      2 TI=706
32043 TUS MS        START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011                12   120
32043 TUS M E       END     6  TASK      6  JOB      2 TI=706
32043 TUS MS        START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011                 2   120
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32043 TUS M E    END    10  TASK      6  JOB      2 TI=706
32043 TUS MS     START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      12       60011                2   120
32043 TUS M E    END    20  TASK      6  JOB      2 TI=706
32043 TUS MS     START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      12       60015                6   120
32043 TUS M E    END    22  TASK      6  JOB      2 TI=706
32043 TUS MS     START   9  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60012      13       70001               24   120
32043 TUS M E    END     9  TASK      6  JOB      2 TI=706
32043 TUS MS     START  13  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60009      10       70001               32   120
32043 TUS M E    END    13  TASK      6  JOB      2 TI=706
32043 TUS MS     START  15  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60010      11       70001               34   120
32043 TUS M E    END    15  TASK      6  JOB      2 TI=706
32043 TUS MS     START  17  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60011      12       70001               30   120
32043 TUS M E    END    17  TASK      6  JOB      2 TI=706
32043 TUS MS     START  19  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60012      13       70001               14   120
32043 TUS M E    END    19  TASK      6  JOB      2 TI=706
32043 TUS MS     START  25  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60016      13       70001               26   120
32043 TUS M E    END    25  TASK      6  JOB      2 TI=706
32043 TUS MS     START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60014      11       70001               12   120
32043 TUS M E    END    27  TASK      6  JOB      2 TI=706
32043 TUS MS     START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60011      12       70001               56   120
32043 TUS M E    END     7  TASK      6  JOB      2 TI=706
32043 TUS MS     START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60011      12       70001               28   120
32043 TUS M E    END    11  TASK      6  JOB      2 TI=706
32043 TUS MS     START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60011      12       70001               14   120
32043 TUS M E    END    21  TASK      6  JOB      2 TI=706
32043 TUS MS     START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60015      12       70001               18   120
32043 TUS M E    END    23  TASK      6  JOB      2 TI=706
32044 TUS MS     START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      10       60017               72   120
32044 TUS M E    END    54  TASK      6  JOB      2 TI=706
32044 TUS MS     START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      11       60010               52   120
32044 TUS M E    END    50  TASK      6  JOB      2 TI=706
32044 TUS MS     START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      11       60010                4   120
32044 TUS M E    END    52  TASK      6  JOB      2 TI=706
32044 TUS MS     START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      12       60015               36   120
32044 TUS M E    END    53  TASK      6  JOB      2 TI=706
32044 TUS MS     START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      10       60013                2   120
32044 TUS M E    END    26  TASK      6  JOB      2 TI=706
32044 TUS MS     START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      11       60010               12   120
32044 TUS M E    END     6  TASK      6  JOB      2 TI=706
32044 TUS MS     START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      11       60010                2   120
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32044 TUS M E      END    10  TASK      6  JOB      2 TI=706
32044 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11       60010                2   120
32044 TUS M E      END    20  TASK      6  JOB      2 TI=706
32044 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11       60014                6   120
32044 TUS M E      END    22  TASK      6  JOB      2 TI=706
32044 TUS MS       START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60009               52   120
32044 TUS M E      END    50  TASK      6  JOB      2 TI=706
32044 TUS MS       START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60009                4   120
32044 TUS M E      END    52  TASK      6  JOB      2 TI=706
32044 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11       60014               36   120
32044 TUS M F      END    53  TASK      6  JOB      2 TI=706
32044 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60013      10       70001               12   120
32044 TUS M E      END    27  TASK      6  JOB      2 TI=706
32044 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11       70001               56   120
32044 TUS M E      END     7  TASK      6  JOB      2 TI=706
32044 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11       70001               28   120
32044 TUS M E      END    11  TASK      6  JOB      2 TI=706
32044 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11       70001               14   120
32044 TUS M E      END    21  TASK      6  JOB      2 TI=706
32044 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014      11       70001               18   120
32044 TUS M E      END    23  TASK      6  JOB      2 TI=706
32044 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60013               36   120
32044 TUS M E      END    53  TASK      6  JOB      2 TI=706
32045 TUS M E      END    58  TASK      7  JOB      2 TI=707
32045 TUS    T   I INTERRUPT  TASK      6  JOB      2 TI=706
32045 TUS    T X   EXECUTING  TASK      7  JOB      2 TI=707
32045 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60009               12   120
32045 TUS M E      END     6  TASK      6  JOB      2 TI=706
32045 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70003       1       70001              256   120
32045 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001       2       70003              256   120
32045 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60009                2   120
32045 TUS M E      END    10  TASK      6  JOB      2 TI=706
32045 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60009                2   120
32045 TUS M E      END    20  TASK      6  JOB      2 TI=706
32045 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10       60013                6   120
32045 TUS M E      END    22  TASK      6  JOB      2 TI=706
32045 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10       70001               56   120
32045 TUS M E      END     7  TASK      6  JOB      2 TI=706
32045 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10       70001               28   120
32045 TUS M E      END    11  TASK      6  JOB      2 TI=706
32045 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
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                    PATH  60009      10       70001              14   120
32045 TUS M E       END    21  TASK     6  JOB      2 TI=706
32045 TUS MS        START  23  TASK     6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60013      10       70001              18   120
32045 TUS M E       END    23  TASK     6  JOB      2 TI=706
32047 TUS M E       END    28  TASK     7  JOB      2 TI=707
32047 TUS M E       END    29  TASK     7  JOB      2 TI=707
32047 TUS MS        START  28  TASK     7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70002       1       70001             256   120
32047 TUS MS        START  29  TASK     7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001       2       70002             256   120
32049 TUS M E       END    28  TASK     7  JOB      2 TI=707
32049 TUS M E       END    29  TASK     7  JOB      2 TI=707
32049 TUS    T  E   END        TASK     7  JOB      2 TI=707
32049 TUS    T X    EXECUTING  TASK     6  JOB      2 TI=706
32049 TUS    T  E   END        TASK     6  JOB      2 TI=706
32049 TUS    T X    EXECUTING  TASK     9  JOB      2 TI=709
32052 TUS    T  E   END        TASK     9  JOB      2 TI=709
32052 TUS    T X    EXECUTING  TASK    14  JOB      2 TI=714
32052 TUS    T X    EXECUTING  TASK    11  JOB      2 TI=711
32052 TUS    T  E   END        TASK    14  JOB      2 TI=714
32052 TUS MS        START  32  TASK    11  JOB      2 TI=711 LENGTH  RATE
                    PATH  70001      24       60095             256   120
32054 TUS M E       END    32  TASK    11  JOB      2 TI=711
32054 TUS MS        START  33  TASK    11  JOB      2 TI=711 LENGTH  RATE
                    PATH  60095      24       70001             256   120
32054 TUS    T   W  MSG WAIT   TASK    11  JOB      2 TI=711
32054 TUS    T X    EXECUTING  TASK    34  JOB      2 TI=723
32056 TUS M E       END    33  TASK    11  JOB      2 TI=711
32056 TUS    T    I INTERRUPT  TASK    34  JOB      2 TI=723
32056 TUS    T X    EXECUTING  TASK    11  JOB      2 TI=711
32056 TUS    T  E   END        TASK    11  JOB      2 TI=711
32056 TUS    T X    EXECUTING  TASK    34  JOB      2 TI=723
32056 TUS    T  E   END        TASK    34  JOB      2 TI=723
32056 TUS    T X    EXECUTING  TASK    35  JOB      2 TI=724
32061 TUS    T  E   END        TASK    35  JOB      2 TI=724
32061 TUS    T X    EXECUTING  TASK    19  JOB      2 TI=716
32069 TUS    T  E   END        TASK    19  JOB      2 TI=716
32069 TUS    T X    EXECUTING  TASK    12  JOB      2 TI=712
32069 TUS    T  E   END        TASK    12  JOB      2 TI=712
32069 TUS    T X    EXECUTING  TASK    24  JOB      2 TI=721
32069 TUS    T  E   END        TASK    24  JOB      2 TI=721
32075 TUS    T X    EXECUTING  TASK    14  JOB      2 TI=714
32075 TUS    T  E   END        TASK    14  JOB      2 TI=714
32075 TUS    T X    EXECUTING  TASK    34  JOB      2 TI=723
32075 TUS MS        START  59  TASK    34  JOB      2 TI=723 LENGTH  RATE
                    PATH  60027       0       70001              10     1
32078 TUS    T   W  MSG WAIT   TASK    34  JOB      2 TI=723
32078 TUS    T X    EXECUTING  TASK    20  JOB      2 TI=717
32079 TUS    T  E   END        TASK    20  JOB      2 TI=717
32081 TUS    T X    EXECUTING  TASK     7  JOB      2 TI=707
32081 TUS MS        START  58  TASK     7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001      24       60095             512   120
32081 TUS MS        START  28  TASK     7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70004       1       70001             256   120
32081 TUS MS        START  29  TASK     7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001       2       70004             256   120
32083 TUS M E       END    28  TASK     7  JOB      2 TI=707
32083 TUS M E       END    29  TASK     7  JOB      2 TI=707
32083 TUS    T   W  MSG WAIT   TASK     7  JOB      2 TI=707
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32083 TUS     T X    EXECUTING  TASK        6  JOB      2 TI=706
32083 TUS MS         START  51  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       13       60012                48   120
32083 TUS M E        END    51  TASK        6  JOB      2 TI=706
32083 TUS MS         START  54  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       10       60018                72   120
32083 TUS M E        END    54  TASK        6  JOB      2 TI=706
32083 TUS MS         START  50  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       12       60011                52   120
32083 TUS M E        END    50  TASK        6  JOB      2 TI=706
32083 TUS MS         START  52  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       12       60011                 4   120
32083 TUS M E        END    52  TASK        6  JOB      2 TI=706
32083 TUS MS         START  53  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       13       60016                36   120
32083 TUS M E        END    53  TASK        6  JOB      2 TI=706
32083 TUS MS         START   8  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       13       60012                 2   120
32083 TUS M E        END     8  TASK        6  JOB      2 TI=706
32083 TUS MS         START  12  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       10       60009                12   120
32083 TUS M E        END    12  TASK        6  JOB      2 TI=706
32083 TUS MS         START  14  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       11       60010                10   120
32083 TUS M E        END    14  TASK        6  JOB      2 TI=706
32083 TUS MS         START  16  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       12       60011                10   120
32083 TUS M E        END    16  TASK        6  JOB      2 TI=706
32083 TUS MS         START  18  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       13       60012                 2   120
32083 TUS M E        END    18  TASK        6  JOB      2 TI=706
32083 TUS MS         START  24  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       13       60016                 6   120
32083 TUS M E        END    24  TASK        6  JOB      2 TI=706
32083 TUS MS         START  26  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       11       60014                 2   120
32083 TUS M E        END    26  TASK        6  JOB      2 TI=706
32083 TUS MS         START   6  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       12       60011                12   120
32083 TUS M E        END     6  TASK        6  JOB      2 TI=706
32083 TUS MS         START  10  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       12       60011                 2   120
32083 TUS M E        END    10  TASK        6  JOB      2 TI=706
32083 TUS MS         START  20  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       12       60011                 2   120
32083 TUS M E        END    20  TASK        6  JOB      2 TI=706
32083 TUS MS         START  22  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  70001       12       60015                 6   120
32083 TUS M E        END    22  TASK        6  JOB      2 TI=706
32083 TUS MS         START   9  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  60012       13       70001                24   120
32083 TUS M E        END     9  TASK        6  JOB      2 TI=706
32083 TUS MS         START  13  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  60009       10       70001                32   120
32083 TUS M E        END    13  TASK        6  JOB      2 TI=706
32083 TUS MS         START  15  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  60010       11       70001                34   120
32083 TUS M E        END    15  TASK        6  JOB      2 TI=706
32083 TUS MS         START  17  TASK        6  JOB      2 TI=706 LENGTH  RATE
                     PATH  60011       12       70001                30   120
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32083 TUS M E      END    17  TASK      6  JOB      2 TI=706
32083 TUS MS       START  19  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012       13      70001              14   120
32083 TUS M E      END    19  TASK      6  JOB      2 TI=706
32083 TUS MS       START  25  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60016       13      70001              26   120
32083 TUS M E      END    25  TASK      6  JOB      2 TI=706
32083 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014       11      70001              12   120
32083 TUS M E      END    27  TASK      6  JOB      2 TI=706
32083 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011       12      70001              56   120
32083 TUS M E      END     7  TASK      6  JOB      2 TI=706
32083 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011       12      70001              28   120
32083 TUS M E      END    11  TASK      6  JOB      2 TI=706
32083 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011       12      70001              14   120
32083 TUS M E      END    21  TASK      6  JOB      2 TI=706
32083 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60015       12      70001              18   120
32083 TUS M E      END    23  TASK      6  JOB      2 TI=706
32085 TUS M E      END    59  TASK     34  JOB      2 TI=723
32085 TUS M E      END    58  TASK      7  JOB      2 TI=707
32085 TUS    T   I INTERRUPT  TASK      6  JOB      2 TI=706
32085 TUS    T X   EXECUTING  TASK      7  JOB      2 TI=707
32085 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70003        1      70001             256   120
32085 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001        2      70003             256   120
32087 TUS M E      END    28  TASK      7  JOB      2 TI=707
32087 TUS M E      END    29  TASK      7  JOB      2 TI=707
32087 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70002        1      70001             256   120
32087 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001        2      70002             256   120
32089 TUS M E      END    28  TASK      7  JOB      2 TI=707
32089 TUS M E      END    29  TASK      7  JOB      2 TI=707
32089 TUS   T  E   END        TASK      7  JOB      2 TI=707
32089 TUS    T X   EXECUTING  TASK      6  JOB      2 TI=706
32091 TUS MS       START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       10      60017              72   120
32091 TUS M E      END    54  TASK      6  JOB      2 TI=706
32091 TUS MS       START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60010              52   120
32091 TUS M E      END    50  TASK      6  JOB      2 TI=706
32091 TUS MS       START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60010               4   120
32091 TUS M E      END    52  TASK      6  JOB      2 TI=706
32091 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12      60015              36   120
32091 TUS M E      END    53  TASK      6  JOB      2 TI=706
32091 TUS MS       START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       10      60013               2   120
32091 TUS M E      END    26  TASK      6  JOB      2 TI=706
32091 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60010              12   120
32091 TUS M E      END     6  TASK      6  JOB      2 TI=706
32091 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60010               2   120
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32091 TUS M E      END    10  TASK      6  JOB      2 TI=706
32091 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60010                2   120
32091 TUS M E      END    20  TASK      6  JOB      2 TI=706
32091 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60014                6   120
32091 TUS M E      END    22  TASK      6  JOB      2 TI=706
32091 TUS MS       START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009               52   120
32091 TUS M E      END    50  TASK      6  JOB      2 TI=706
32091 TUS MS       START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009                4   120
32091 TUS M E      END    52  TASK      6  JOB      2 TI=706
32091 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60014               36   120
32091 TUS M E      END    53  TASK      6  JOB      2 TI=706
32091 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60013      10      70001               12   120
32091 TUS M E      END    27  TASK      6  JOB      2 TI=706
32091 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11      70001               56   120
32091 TUS M E      END     7  TASK      6  JOB      2 TI=706
32091 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11      70001               28   120
32091 TUS M E      END    11  TASK      6  JOB      2 TI=706
32091 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11      70001               14   120
32091 TUS M E      END    21  TASK      6  JOB      2 TI=706
32091 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014      11      70001               18   120
32091 TUS M E      END    23  TASK      6  JOB      2 TI=706
32091 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60013               36   120
32091 TUS M E      END    53  TASK      6  JOB      2 TI=706
32092 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009               12   120
32092 TUS M E      END     6  TASK      6  JOB      2 TI=706
32092 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009                2   120
32092 TUS M E      END    10  TASK      6  JOB      2 TI=706
32092 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009                2   120
32092 TUS M E      END    20  TASK      6  JOB      2 TI=706
32092 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60013                6   120
32092 TUS M E      END    22  TASK      6  JOB      2 TI=706
32092 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001               56   120
32092 TUS M E      END     7  TASK      6  JOB      2 TI=706
32092 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001               28   120
32092 TUS M E      END    11  TASK      6  JOB      2 TI=706
32092 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001               14   120
32092 TUS M E      END    21  TASK      6  JOB      2 TI=706
32092 TUS MS       START   3  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  6 )13      10      70001               18   120
32092 TUS M E      END     3  TASK      6  JOB      2 TI=706
32092 TUS    T  E  END        TASK      6  JOB      2 TI=706
32092 TUS    T X   EXECUTING  TASK      9  JOB      2 TI=709
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32095 TUS     T  E   END          TASK      9  JOB      2 TI=709
32095 TUS     T X    EXECUTING    TASK     10  JOB      2 TI=710
32101 TUS     T    I INTERRUPT    TASK     10  JOB      2 TI=710
32101 TUS     T X    EXECUTING    TASK     11  JOB      2 TI=711
32102 TUS MS          START  32   TASK     11  JOB      2 TI=711 LENGTH   RATE
                      PATH  70001       24       60095              256    120
32104 TUS M E         END    32   TASK     11  JOB      2 TI=711
32104 TUS MS          START  33   TASK     11  JOB      2 TI=711 LENGTH   RATE
                      PATH  60095       24       70001              256    120
32104 TUS     T   W  MSG WAIT    TASK     11  JOB      2 TI=711
32104 TUS     T X    EXECUTING    TASK     10  JOB      2 TI=710
32106 TUS M E         END    33   TASK     11  JOB      2 TI=711
32106 TUS     T    I INTERRUPT    TASK     10  JOB      2 TI=710
32106 TUS     T X    EXECUTING    TASK     11  JOB      2 TI=711
32106 TUS     T  E   END          TASK     11  JOB      2 TI=711
32106 TUS     T X    EXECUTING    TASK     10  JOB      2 TI=710
32109 TUS     T  E   END          TASK     10  JOB      2 TI=710
32109 TUS     T X    EXECUTING    TASK     34  JOB      2 TI=723
32109 TUS     T  E   END          TASK     34  JOB      2 TI=723
32109 TUS     T X    EXECUTING    TASK     35  JOB      2 TI=724
32109 TUS MS          START  55   TASK     35  JOB      2 TI=724 LENGTH   RATE
                      PATH  70001        6       60001             1024    120
32109 TUS MS          START  56   TASK     35  JOB      2 TI=724 LENGTH   RATE
                      PATH  70001        7       60002             1024    120
32109 TUS MS          START  57   TASK     35  JOB      2 TI=724 LENGTH   RATE
                      PATH  70001        8       60003             1024    120
32117 TUS M E         END    55   TASK     35  JOB      2 TI=724
32117 TUS M E         END    56   TASK     35  JOB      2 TI=724
32117 TUS M E         END    57   TASK     35  JOB      2 TI=724
32121 TUS     T    I INTERRUPT    TASK     35  JOB      2 TI=724
32121 TUS     T X    EXECUTING    TASK      7  JOB      2 TI=707
32121 TUS MS          START  58   TASK      7  JOB      2 TI=707 LENGTH   RATE
                      PATH  70001       24       60095              512    120
32121 TUS MS          START  28   TASK      7  JOB      2 TI=707 LENGTH   RATE
                      PATH  70004        1       70001              256    120
32121 TUS MS          START  29   TASK      7  JOB      2 TI=707 LENGTH   RATE
                      PATH  70001        2       70004              256    120
32123 TUS M E         END    28   TASK      7  JOB      2 TI=707
32123 TUS M E         END    29   TASK      7  JOB      2 TI=707
32123 TUS     T   W  MSG WAIT    TASK      7  JOB      2 TI=707
32123 TUS     T X    EXECUTING    TASK      6  JOB      2 TI=706
32123 TUS MS          START  51   TASK      6  JOB      2 TI=706 LENGTH   RATE
                      PATH  70001       13       60012               48    120
32123 TUS M E         END    51   TASK      6  JOB      2 TI=706
32123 TUS MS          START  54   TASK      6  JOB      2 TI=706 LENGTH   RATE
                      PATH  70001       10       60018               72    120
32123 TUS M E         END    54   TASK      6  JOB      2 TI=706
32123 TUS MS          START  50   TASK      6  JOB      2 TI=706 LENGTH   RATE
                      PATH  70001       12       60011               52    120
32123 TUS M E         END    50   TASK      6  JOB      2 TI=706
32123 TUS MS          START  52   TASK      6  JOB      2 TI=706 LENGTH   RATE
                      PATH  70001       12       60011                4    120
32123 TUS M E         END    52   TASK      6  JOB      2 TI=706
32123 TUS MS          START  53   TASK      6  JOB      2 TI=706 LENGTH   RATE
                      PATH  70001       13       60016               36    120
32123 TUS M E         END    53   TASK      6  JOB      2 TI=706
32123 TUS MS          START   8   TASK      6  JOB      2 TI=706 LENGTH   RATE
                      PATH  70001       13       60012                2    120
32123 TUS M E         END     8   TASK      6  JOB      2 TI=706
32123 TUS MS          START  12   TASK      6  JOB      2 TI=706 LENGTH   RATE
                      PATH  70001       10       60009               12    120
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32123 TUS M E     END    12  TASK      6  JOB     2 TI=706
32123 TUS MS      START  14  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001      11      60010              10   120
32123 TUS M E     END    14  TASK      6  JOB     2 TI=706
32123 TUS MS      START  16  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001      12      60011              10   120
32123 TUS M E     END    16  TASK      6  JOB     2 TI=706
32123 TUS MS      START  18  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001      13      60012               2   120
32123 TUS M E     END    18  TASK      6  JOB     2 TI=706
32123 TUS MS      START  24  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001      13      60016               6   120
32123 TUS M E     END    24  TASK      6  JOB     2 TI=706
32123 TUS MS      START  26  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001      11      60014               2   120
32123 TUS M E     END    26  TASK      6  JOB     2 TI=706
32123 TUS MS      START   6  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001      12      60011              12   120
32123 TUS M E     END     6  TASK      6  JOB     2 TI=706
32123 TUS MS      START  10  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001      12      60011               2   120
32123 TUS M E     END    10  TASK      6  JOB     2 TI=706
32123 TUS MS      START  20  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001      12      60011               2   120
32123 TUS M E     END    20  TASK      6  JOB     2 TI=706
32123 TUS MS      START  22  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001      12      60015               6   120
32123 TUS M E     END    22  TASK      6  JOB     2 TI=706
32123 TUS MS      START   9  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60012      13      70001              24   120
32123 TUS M E     END     9  TASK      6  JOB     2 TI=706
32123 TUS MS      START  13  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60009      10      70001              32   120
32123 TUS M E     END    13  TASK      6  JOB     2 TI=706
32123 TUS MS      START  15  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60010      11      70001              34   120
32123 TUS M E     END    15  TASK      6  JOB     2 TI=706
32123 TUS MS      START  17  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001              30   120
32123 TUS M E     END    17  TASK      6  JOB     2 TI=706
32123 TUS MS      START  19  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60012      13      70001              14   120
32123 TUS M E     END    19  TASK      6  JOB     2 TI=706
32123 TUS MS      START  25  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60016      13      70001              26   120
32123 TUS M E     END    25  TASK      6  JOB     2 TI=706
32123 TUS MS      START  27  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60014      11      70001              12   120
32123 TUS M E     END    27  TASK      6  JOB     2 TI=706
32123 TUS MS      START   7  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001              56   120
32123 TUS M E     END     7  TASK      6  JOB     2 TI=706
32123 TUS MS      START  11  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001              28   120
32123 TUS M E     END    11  TASK      6  JOB     2 TI=706
32123 TUS MS      START  21  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001              14   120
32123 TUS M E     END    21  TASK      6  JOB     2 TI=706
32123 TUS MS      START  23  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60015      12      70001              18   120
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32123 TUS M E      END    23  TASK      6  JOB      2 TI=706
32125 TUS M E      END    58  TASK      7  JOB      2 TI=707
32125 TUS    T   I INTERRUPT  TASK      6  JOB      2 TI=706
32125 TUS    T X   EXECUTING  TASK      7  JOB      2 TI=707
32125 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70003        1      70001                256   120
32125 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001        2      70003                256   120
32127 TUS M E      END    28  TASK      7  JOB      2 TI=707
32127 TUS M E      END    29  TASK      7  JOB      2 TI=707
32127 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70002        1      70001                256   120
32127 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001        2      70002                256   120
32129 TUS M E      END    28  TASK      7  JOB      2 TI=707
32129 TUS M E      END    29  TASK      7  JOB      2 TI=707
32129 TUS    T  E  END        TASK      7  JOB      2 TI=707
32129 TUS    T X   EXECUTING  TASK      6  JOB      2 TI=706
32129 TUS MS       START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       10      60017                72   120
32129 TUS M E      END    54  TASK      6  JOB      2 TI=706
32129 TUS MS       START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60010                52   120
32129 TUS M E      END    50  TASK      6  JOB      2 TI=706
32129 TUS MS       START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60010                 4   120
32129 TUS M E      END    52  TASK      6  JOB      2 TI=706
32129 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12      60015                36   120
32129 TUS M E      END    53  TASK      6  JOB      2 TI=706
32129 TUS MS       START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       10      60013                 2   120
32129 TUS M E      END    26  TASK      6  JOB      2 TI=706
32129 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60010                12   120
32129 TUS M E      END     6  TASK      6  JOB      2 TI=706
32129 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60010                 2   120
32129 TUS M E      END    10  TASK      6  JOB      2 TI=706
32129 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60010                 2   120
32129 TUS M E      END    20  TASK      6  JOB      2 TI=706
32129 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60014                 6   120
32129 TUS M E      END    22  TASK      6  JOB      2 TI=706
32129 TUS MS       START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       10      60009                52   120
32129 TUS M E      END    50  TASK      6  JOB      2 TI=706
32129 TUS MS       START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       10      60009                 4   120
32129 TUS M E      END    52  TASK      6  JOB      2 TI=706
32129 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60014                36   120
32129 TUS M E      END    53  TASK      6  JOB      2 TI=706
32129 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60013       10      70001                12   120
32129 TUS M E      END    27  TASK      6  JOB      2 TI=706
32129 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010       11      70001                56   120
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32129 TUS M E      END     7  TASK      6  JOB      2 TI=706
32129 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11      70001              28   120
32129 TUS M E      END    11  TASK      6  JOB      2 TI=706
32129 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11      70001              14   120
32129 TUS M E      END    21  TASK      6  JOB      2 TI=706
32129 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014      11      70001              18   120
32129 TUS M E      END    23  TASK      6  JOB      2 TI=706
32129 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60013              36   120
32129 TUS M E      END    53  TASK      6  JOB      2 TI=706
32130 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009              12   120
32130 TUS M E      END     6  TASK      6  JOB      2 TI=706
32130 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009               2   120
32130 TUS M E      END    10  TASK      6  JOB      2 TI=706
32130 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009               2   120
32130 TUS M E      END    20  TASK      6  JOB      2 TI=706
32130 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60013               6   120
32130 TUS M E      END    22  TASK      6  JOB      2 TI=706
32130 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001              56   120
32130 TUS M E      END     7  TASK      6  JOB      2 TI=706
32130 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001              28   120
32130 TUS M E      END    11  TASK      6  JOB      2 TI=706
32130 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001              14   120
32130 TUS M E      END    21  TASK      6  JOB      2 TI=706
32130 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60013      10      70001              18   120
32130 TUS M E      END    23  TASK      6  JOB      2 TI=706
32130 TUS    T  E  END        TASK      6  JOB      2 TI=706
32130 TUS    T X   EXECUTING  TASK      9  JOB      2 TI=709
32133 TUS    T  E  END        TASK      9  JOB      2 TI=709
32133 TUS    T X   EXECUTING  TASK     13  JOB      2 TI=713
32133 TUS    T X   EXECUTING  TASK     14  JOB      2 TI=714
32133 TUS    T  E  END        TASK     13  JOB      2 TI=713
32133 TUS    T  E  END        TASK     14  JOB      2 TI=714
32133 TUS    T X   EXECUTING  TASK     34  JOB      2 TI=723
32135 TUS    T  E  END        TASK     34  JOB      2 TI=723
32135 TUS    T X   EXECUTING  TASK     35  JOB      2 TI=724
32135 TUS    T  E  END        TASK     35  JOB      2 TI=724
32151 TUS    T X   EXECUTING  TASK     11  JOB      2 TI=711
32152 TUS MS       START  32  TASK     11  JOB      2 TI=711 LENGTH  RATE
                   PATH  70001      24      60095             256   120
32154 TUS M E      END    32  TASK     11  JOB      2 TI=711
32154 TUS MS       START  33  TASK     11  JOB      2 TI=711 LENGTH  RATE
                   PATH  60095      24      70001             256   120
32154 TUS    T  W  MSG WAIT   TASK     11  JOB      2 TI=711
32156 TUS M E      END    33  TASK     11  JOB      2 TI=711
32156 TUS    T X   EXECUTING  TASK     11  JOB      2 TI=711
32156 TUS    T  E  END        TASK     11  JOB      2 TI=711
32160 TUS    T X   EXECUTING  TASK     14  JOB      2 TI=714
32160 TUS    T  E  END        TASK     14  JOB      2 TI=714
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32160 TUS    T X    EXECUTING  TASK      34  JOB      2 TI=723
32160 TUS MS        START  59  TASK      34  JOB      2 TI=723 LENGTH  RATE
                    PATH  60027          0      70001                10     1
32161 TUS    T    I INTERRUPT  TASK      34  JOB      2 TI=723
32161 TUS    T X    EXECUTING  TASK       7  JOB      2 TI=707
32161 TUS MS        START  58  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001          24      60095              512   120
32161 TUS MS        START  28  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70004           1      70001              256   120
32161 TUS MS        START  29  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001           2      70004              256   120
32163 TUS M E       END    28  TASK       7  JOB      2 TI=707
32163 TUS M E       END    29  TASK       7  JOB      2 TI=707
32163 TUS    T   W  MSG WAIT  TASK       7  JOB      2 TI=707
32163 TUS    T X    EXECUTING  TASK       6  JOB      2 TI=706
32163 TUS MS        START  51  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          13      60012               48   120
32163 TUS M E       END    51  TASK       6  JOB      2 TI=706
32163 TUS MS        START  54  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          10      60018               72   120
32163 TUS M E       END    54  TASK       6  JOB      2 TI=706
32163 TUS MS        START  50  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          12      60011               52   120
32163 TUS M E       END    50  TASK       6  JOB      2 TI=706
32163 TUS MS        START  52  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          12      60011                4   120
32163 TUS M E       END    52  TASK       6  JOB      2 TI=706
32163 TUS MS        START  53  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          13      60016               36   120
32163 TUS M E       END    53  TASK       6  JOB      2 TI=706
32163 TUS MS        START   8  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          13      60012                2   120
32163 TUS M E       END     8  TASK       6  JOB      2 TI=706
32163 TUS MS        START  12  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          10      60009               12   120
32163 TUS M E       END    12  TASK       6  JOB      2 TI=706
32163 TUS MS        START  14  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          11      60010               10   120
32163 TUS M E       END    14  TASK       6  JOB      2 TI=706
32163 TUS MS        START  16  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          12      60011               10   120
32163 TUS M E       END    16  TASK       6  JOB      2 TI=706
32163 TUS MS        START  18  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          13      60012                2   120
32163 TUS M E       END    18  TASK       6  JOB      2 TI=706
32163 TUS MS        START  24  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          13      60016                6   120
32163 TUS M E       END    24  TASK       6  JOB      2 TI=706
32163 TUS MS        START  26  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          11      60014                2   120
32163 TUS M E       END    26  TASK       6  JOB      2 TI=706
32163 TUS MS        START   6  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          12      60011               12   120
32163 TUS M E       END     6  TASK       6  JOB      2 TI=706
32163 TUS MS        START  10  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          12      60011                2   120
32163 TUS M E       END    10  TASK       6  JOB      2 TI=706
32163 TUS MS        START  20  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          12      60011                2   120
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32163 TUS M E      END    20  TASK      6  JOB      2 TI=706
32163 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60015                6   120
32163 TUS M E      END    22  TASK      6  JOB      2 TI=706
32163 TUS MS       START   9  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012      13      70001               24   120
32163 TUS M E      END     9  TASK      6  JOB      2 TI=706
32163 TUS MS       START  13  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001               32   120
32163 TUS M E      END    13  TASK      6  JOB      2 TI=706
32163 TUS MS       START  15  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11      70001               34   120
32163 TUS M E      END    15  TASK      6  JOB      2 TI=706
32163 TUS MS       START  17  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001               30   120
32163 TUS M E      END    17  TASK      6  JOB      2 TI=706
32163 TUS MS       START  19  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012      13      70001               14   120
32163 TUS M E      END    19  TASK      6  JOB      2 TI=706
32163 TUS MS       START  25  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60016      13      70001               26   120
32163 TUS M E      END    25  TASK      6  JOB      2 TI=706
32163 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014      11      70001               12   120
32163 TUS M E      END    27  TASK      6  JOB      2 TI=706
32163 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001               56   120
32163 TUS M E      END     7  TASK      6  JOB      2 TI=706
32163 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001               28   120
32163 TUS M E      END    11  TASK      6  JOB      2 TI=706
32163 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001               14   120
32163 TUS M E      END    21  TASK      6  JOB      2 TI=706
32163 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60015      12      70001               18   120
32163 TUS M E      END    23  TASK      6  JOB      2 TI=706
32165 TUS M E      END    58  TASK      7  JOB      2 TI=707
32165 TUS    T   I INTERRUPT  TASK      6  JOB      2 TI=706
32165 TUS    T X   EXECUTING  TASK      7  JOB      2 TI=707
32165 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70003       1      70001              256   120
32165 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001       2      70003              256   120
32167 TUS M E      END    28  TASK      7  JOB      2 TI=707
32167 TUS M E      END    29  TASK      7  JOB      2 TI=707
32167 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70002       1      70001              256   120
32167 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001       2      70002              256   120
32169 TUS M E      END    28  TASK      7  JOB      2 TI=707
32169 TUS M E      END    29  TASK      7  JOB      2 TI=707
32169 TUS    T  E  END        TASK      7  JOB      2 TI=707
32169 TUS    T X   EXECUTING  TASK      6  JOB      2 TI=706
32170 TUS M E      END    59  TASK     34  JOB      2 TI=723
32171 TUS MS       START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60017               72   120
32171 TUS M E      END    54  TASK      6  JOB      2 TI=706
32171 TUS MS       START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60010               52   120
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32171 TUS M E     END    50  TASK      6  JOB      2 TI=706
32171 TUS MS      START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11       60010                4   120
32171 TUS M E     END    52  TASK      6  JOB      2 TI=706
32171 TUS MS      START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      12       60015               36   120
32171 TUS M E     END    53  TASK      6  JOB      2 TI=706
32171 TUS MS      START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60013                2   120
32171 TUS M E     END    26  TASK      6  JOB      2 TI=706
32171 TUS MS      START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11       60010               12   120
32171 TUS M E     END     6  TASK      6  JOB      2 TI=706
32171 TUS MS      START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11       60010                2   120
32171 TUS M E     END    10  TASK      6  JOB      2 TI=706
32171 TUS MS      START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11       60010                2   120
32171 TUS M E     END    20  TASK      6  JOB      2 TI=706
32171 TUS MS      START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11       60014                6   120
32171 TUS M E     END    22  TASK      6  JOB      2 TI=706
32171 TUS MS      START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60009               52   120
32171 TUS M E     END    50  TASK      6  JOB      2 TI=706
32171 TUS MS      START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60009                4   120
32171 TUS M E     END    52  TASK      6  JOB      2 TI=706
32171 TUS MS      START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11       60014               36   120
32171 TUS M E     END    53  TASK      6  JOB      2 TI=706
32171 TUS MS      START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60013      10       70001               12   120
32171 TUS M E     END    27  TASK      6  JOB      2 TI=706
32171 TUS MS      START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11       70001               56   120
32171 TUS M E     END     7  TASK      6  JOB      2 TI=706
32171 TUS MS      START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11       70001               28   120
32171 TUS M E     END    11  TASK      6  JOB      2 TI=706
32171 TUS MS      START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11       70001               14   120
32171 TUS M E     END    21  TASK      6  JOB      2 TI=706
32171 TUS MS      START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60014      11       70001               18   120
32171 TUS M E     END    23  TASK      6  JOB      2 TI=706
32171 TUS MS      START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60013               36   120
32171 TUS M E     END    53  TASK      6  JOB      2 TI=706
32172 TUS MS      START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60009               12   120
32172 TUS M E     END     6  TASK      6  JOB      2 TI=706
32172 TUS MS      START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60009                2   120
32172 TUS M E     END    10  TASK      6  JOB      2 TI=706
32172 TUS MS      START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60009                2   120
32172 TUS M E     END    20  TASK      6  JOB      2 TI=706
32172 TUS MS      START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60013                6   120
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32172 TUS M E       END    22  TASK      6  JOB      2 TI=706
32172 TUS MS        START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001              56   120
32172 TUS M E       END     7  TASK      6  JOB      2 TI=706
32172 TUS MS        START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001              28   120
32172 TUS M E       END    11  TASK      6  JOB      2 TI=706
32172 TUS MS        START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001              14   120
32172 TUS M E       END    21  TASK      6  JOB      2 TI=706
32172 TUS MS        START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60013      10       70001              18   120
32172 TUS M E       END    23  TASK      6  JOB      2 TI=706
32172 TUS    T  E   END        TASK      6  JOB      2 TI=706
32172 TUS    T X    EXECUTING  TASK      9  JOB      2 TI=709
32175 TUS    T  E   END        TASK      9  JOB      2 TI=709
32175 TUS    T X    EXECUTING  TASK     10  JOB      2 TI=710
32186 TUS    T  E   END        TASK     10  JOB      2 TI=710
32186 TUS    T X    EXECUTING  TASK     34  JOB      2 TI=723
32186 TUS    T  E   END        TASK     34  JOB      2 TI=723
32200 TUS    T X    EXECUTING  TASK     14  JOB      2 TI=714
32200 TUS    T  E   END        TASK     14  JOB      2 TI=714
32200 TUS    T X    EXECUTING  TASK     34  JOB      2 TI=723
32200 TUS MS        START  59  TASK      34  JOB      2 TI=723 LENGTH  RATE
                    PATH  60027       0       70001              10     1
32201 TUS    T    I INTERRUPT  TASK     34  JOB      2 TI=723
32201 TUS    T X    EXECUTING  TASK      7  JOB      2 TI=707
32201 TUS MS        START  58  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001      24       60095             512   120
32201 TUS MS        START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70004       1       70001             256   120
32201 TUS MS        START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001       2       70004             256   120
32203 TUS M E       END    28  TASK      7  JOB      2 TI=707
32203 TUS M E       END    29  TASK      7  JOB      2 TI=707
32203 TUS    T   W  MSG WAIT   TASK      7  JOB      2 TI=707
32203 TUS    T X    EXECUTING  TASK      6  JOB      2 TI=706
32203 TUS MS        START  51  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012              48   120
32203 TUS M E       END    51  TASK      6  JOB      2 TI=706
32203 TUS MS        START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60018              72   120
32203 TUS M E       END    54  TASK      6  JOB      2 TI=706
32203 TUS MS        START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011              52   120
32203 TUS M E       END    50  TASK      6  JOB      2 TI=706
32203 TUS MS        START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011               4   120
32203 TUS M E       END    52  TASK      6  JOB      2 TI=706
32203 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60016              36   120
32203 TUS M E       END    53  TASK      6  JOB      2 TI=706
32203 TUS MS        START   8  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012               2   120
32203 TUS M E       END     8  TASK      6  JOB      2 TI=706
32203 TUS MS        START  12  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009              12   120
32203 TUS M E       END    12  TASK      6  JOB      2 TI=706
32203 TUS MS        START  14  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60010              10   120
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32203 TUS M E      END    14  TASK        6  JOB      2 TI=706
32203 TUS MS       START  16  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12       60011                10  120
32203 TUS M E      END    16  TASK        6  JOB      2 TI=706
32203 TUS MS       START  18  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       13       60012                 2  120
32203 TUS M E      END    18  TASK        6  JOB      2 TI=706
32203 TUS MS       START  24  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       13       60016                 6  120
32203 TUS M E      END    24  TASK        6  JOB      2 TI=706
32203 TUS MS       START  26  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11       60014                 2  120
32203 TUS M E      END    26  TASK        6  JOB      2 TI=706
32203 TUS MS       START   6  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12       60011                12  120
32203 TUS M E      END     6  TASK        6  JOB      2 TI=706
32203 TUS MS       START  10  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12       60011                 2  120
32203 TUS M E      END    10  TASK        6  JOB      2 TI=706
32203 TUS MS       START  20  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12       60011                 2  120
32203 TUS M E      END    20  TASK        6  JOB      2 TI=706
32203 TUS MS       START  22  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12       60015                 6  120
32203 TUS M E      END    22  TASK        6  JOB      2 TI=706
32203 TUS MS       START   9  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012       13       70001                24  120
32203 TUS M E      END     9  TASK        6  JOB      2 TI=706
32203 TUS MS       START  13  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009       10       70001                32  120
32203 TUS M E      END    13  TASK        6  JOB      2 TI=706
32203 TUS MS       START  15  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010       11       70001                34  120
32203 TUS M E      END    15  TASK        6  JOB      2 TI=706
32203 TUS MS       START  17  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011       12       70001                30  120
32203 TUS M E      END    17  TASK        6  JOB      2 TI=706
32203 TUS MS       START  19  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012       13       70001                14  120
32203 TUS M E      END    19  TASK        6  JOB      2 TI=706
32203 TUS MS       START  25  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60016       13       70001                26  120
32203 TUS M E      END    25  TASK        6  JOB      2 TI=706
32203 TUS MS       START  27  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014       11       70001                12  120
32203 TUS M E      END    27  TASK        6  JOB      2 TI=706
32203 TUS MS       START   7  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011       12       70001                56  120
32203 TUS M E      END     7  TASK        6  JOB      2 TI=706
32203 TUS MS       START  11  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011       12       70001                28  120
32203 TUS M E      END    11  TASK        6  JOB      2 TI=706
32203 TUS MS       START  21  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011       12       70001                14  120
32203 TUS M E      END    21  TASK        6  JOB      2 TI=706
32203 TUS MS       START  23  TASK        6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60015       12       70001                18  120
32203 TUS M E      END    23  TASK        6  JOB      2 TI=706
32205 TUS M E      END    58  TASK        7  JOB      2 TI=707
32205 TUS     T  I INTERRUPT  TASK        6  JOB      2 TI=706
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32205 TUS    T X    EXECUTING  TASK      7  JOB      2 TI=707
32205 TUS MS        START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70003        1      70001              256   120
32205 TUS MS        START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001        2      70003              256   120
32207 TUS M E       END    28  TASK      7  JOB      2 TI=707
32207 TUS M E       END    29  TASK      7  JOB      2 TI=707
32207 TUS MS        START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70002        1      70001              256   120
32207 TUS MS        START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001        2      70002              256   120
32209 TUS M E       END    28  TASK      7  JOB      2 TI=707
32209 TUS M E       END    29  TASK      7  JOB      2 TI=707
32209 TUS    T  E   END        TASK      7  JOB      2 TI=707
32209 TUS    T X    EXECUTING  TASK      6  JOB      2 TI=706
32209 TUS MS        START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       10      60017               72   120
32209 TUS M E       END    54  TASK      6  JOB      2 TI=706
32209 TUS MS        START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       11      60010               52   120
32209 TUS M E       END    50  TASK      6  JOB      2 TI=706
32209 TUS MS        START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       11      60010                4   120
32209 TUS M E       END    52  TASK      6  JOB      2 TI=706
32209 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       12      60015               36   120
32209 TUS M E       END    53  TASK      6  JOB      2 TI=706
32209 TUS MS        START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       10      60013                2   120
32209 TUS M E       END    26  TASK      6  JOB      2 TI=706
32209 TUS MS        START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       11      60010               12   120
32209 TUS M E       END     6  TASK      6  JOB      2 TI=706
32209 TUS MS        START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       11      60010                2   120
32209 TUS M E       END    10  TASK      6  JOB      2 TI=706
32209 TUS MS        START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       11      60010                2   120
32209 TUS M E       END    20  TASK      6  JOB      2 TI=706
32209 TUS MS        START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       11      60014                6   120
32209 TUS M E       END    22  TASK      6  JOB      2 TI=706
32209 TUS MS        START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       10      60009               52   120
32209 TUS M E       END    50  TASK      6  JOB      2 TI=706
32209 TUS MS        START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       10      60009                4   120
32209 TUS M E       END    52  TASK      6  JOB      2 TI=706
32209 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001       11      60014               36   120
32209 TUS M E       END    53  TASK      6  JOB      2 TI=706
32209 TUS MS        START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60013       10      70001               12   120
32209 TUS M E       END    27  TASK      6  JOB      2 TI=706
32209 TUS MS        START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60010       11      70001               56   120
32209 TUS M E       END     7  TASK      6  JOB      2 TI=706
32209 TUS MS        START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60010       11      70001               28   120
32209 TUS M E       END    11  TASK      6  JOB      2 TI=706
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32209 TUS MS        START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60010      11       70001              14   120
32209 TUS M E       END    21  TASK      6  JOB      2 TI=706
32209 TUS MS        START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60014      11       70001              18   120
32209 TUS M E       END    23  TASK      6  JOB      2 TI=706
32209 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60013              36   120
32209 TUS M E       END    53  TASK      6  JOB      2 TI=706
32210 TUS M E       END    59  TASK     34  JOB      2 TI=723
32210 TUS MS        START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009              12   120
32210 TUS M E       END     6  TASK      6  JOB      2 TI=706
32210 TUS MS        START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009               2   120
32210 TUS M E       END    10  TASK      6  JOB      2 TI=706
32210 TUS MS        START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009               2   120
32210 TUS M E       END    20  TASK      6  JOB      2 TI=706
32210 TUS MS        START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60013               6   120
32210 TUS M E       END    22  TASK      6  JOB      2 TI=706
32210 TUS MS        START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001              56   120
32210 TUS M E       END     7  TASK      6  JOB      2 TI=706
32210 TUS MS        START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001              28   120
32210 TUS M E       END    11  TASK      6  JOB      2 TI=706
32210 TUS MS        START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001              14   120
32210 TUS M E       END    21  TASK      6  JOB      2 TI=706
32210 TUS MS        START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60013      10       70001              18   120
32210 TUS M E       END    23  TASK      6  JOB      2 TI=706
32210 TUS    T  E   END        TASK      6  JOB      2 TI=706
32210 TUS    T X    EXECUTING  TASK      9  JOB      2 TI=709
32212 TUS    T  E   END        TASK      9  JOB      2 TI=709
32212 TUS    T X    EXECUTING  TASK     32  JOB      2 TI=722
32213 TUS    T X    EXECUTING  TASK     11  JOB      2 TI=711
32213 TUS    T  E   END        TASK     32  JOB      2 TI=722
32213 TUS MS        START  32  TASK     11  JOB      2 TI=711 LENGTH  RATE
                    PATH  70001      24       60095             256   120
32215 TUS M E       END    32  TASK     11  JOB      2 TI=711
32215 TUS MS        START  33  TASK     11  JOB      2 TI=711 LENGTH  RATE
                    PATH  60095      24       70001             256   120
32215 TUS    T   W  MSG WAIT   TASK     11  JOB      2 TI=711
32215 TUS    T X    EXECUTING  TASK     34  JOB      2 TI=723
32217 TUS M E       END    33  TASK     11  JOB      2 TI=711
32217 TUS    T    I INTERRUPT  TASK     34  JOB      2 TI=723
32217 TUS    T X    EXECUTING  TASK     11  JOB      2 TI=711
32217 TUS    T  E   END        TASK     11  JOB      2 TI=711
32217 TUS    T X    EXECUTING  TASK     34  JOB      2 TI=723
32217 TUS    T  E   END        TASK     34  JOB      2 TI=723
32217 TUS    T X    EXECUTING  TASK     35  JOB      2 TI=724
32217 TUS MS        START  55  TASK     35  JOB      2 TI=724 LENGTH  RATE
                    PATH  70001       6       60001            1024   120
32217 TUS MS        START  56  TASK     35  JOB      2 TI=724 LENGTH  RATE
                    PATH  70001       7       60002            1024   120
32217 TUS MS        START  57  TASK     35  JOB      2 TI=724 LENGTH  RATE
                    PATH  70001       8       60003            1024   120
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32225 TUS M E       END    55  TASK      35  JOB      2 TI=724
32225 TUS M E       END    56  TASK      35  JOB      2 TI=724
32225 TUS M E       END    57  TASK      35  JOB      2 TI=724
32229 TUS    T  E   END        TASK      35  JOB      2 TI=724
32240 TUS    T X    EXECUTING  TASK      13  JOB      2 TI=713
32240 TUS    T X    EXECUTING  TASK      14  JOB      2 TI=714
32240 TUS    T  E   END        TASK      13  JOB      2 TI=713
32240 TUS    T  E   END        TASK      14  JOB      2 TI=714
32240 TUS    T X    EXECUTING  TASK      34  JOB      2 TI=723
32240 TUS MS        START  59  TASK      34  JOB      2 TI=723 LENGTH  RATE
                    PATH  60027          0       70001              10     1
32241 TUS    T    I INTERRUPT  TASK      34  JOB      2 TI=723
32241 TUS    T X    EXECUTING  TASK       7  JOB      2 TI=707
32241 TUS MS        START  58  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001          24       60095              512   120
32241 TUS MS        START  28  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70004           1       70001              256   120
32241 TUS MS        START  29  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001           2       70004              256   120
32243 TUS M E       END    28  TASK       7  JOB      2 TI=707
32243 TUS M E       END    29  TASK       7  JOB      2 TI=707
32243 TUS    T   W  MSG WAIT   TASK       7  JOB      2 TI=707
32243 TUS    T X    EXECUTING  TASK       6  JOB      2 TI=706
32243 TUS MS        START  51  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          13       60012               48   120
32243 TUS M E       END    51  TASK       6  JOB      2 TI=706
32243 TUS MS        START  54  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          10       60018               72   120
32243 TUS M E       END    54  TASK       6  JOB      2 TI=706
32243 TUS MS        START  50  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          12       60011               52   120
32243 TUS M E       END    50  TASK       6  JOB      2 TI=706
32243 TUS MS        START  52  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          12       60011                4   120
32243 TUS M E       END    52  TASK       6  JOB      2 TI=706
32243 TUS MS        START  53  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          13       60016               36   120
32243 TUS M E       END    53  TASK       6  JOB      2 TI=706
32243 TUS MS        START   8  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          13       60012                2   120
32243 TUS M E       END     8  TASK       6  JOB      2 TI=706
32243 TUS MS        START  12  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          10       60009               12   120
32243 TUS M E       END    12  TASK       6  JOB      2 TI=706
32243 TUS MS        START  14  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          11       60010               10   120
32243 TUS M E       END    14  TASK       6  JOB      2 TI=706
32243 TUS MS        START  16  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          12       60011               10   120
32243 TUS M E       END    16  TASK       6  JOB      2 TI=706
32243 TUS MS        START  18  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          13       60012                2   120
32243 TUS M E       END    18  TASK       6  JOB      2 TI=706
32243 TUS MS        START  24  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          13       60016                6   120
32243 TUS M E       END    24  TASK       6  JOB      2 TI=706
32243 TUS MS        START  26  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          11       60014                2   120
32243 TUS M E       END    26  TASK       6  JOB      2 TI=706
32243 TUS MS        START   6  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001          12       60011               12   120
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32243 TUS M E      END     6  TASK      6  JOB     2 TI=706
32243 TUS MS       START  10  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011              2   120
32243 TUS M E      END    10  TASK      6  JOB     2 TI=706
32243 TUS MS       START  20  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011              2   120
32243 TUS M E      END    20  TASK      6  JOB     2 TI=706
32243 TUS MS       START  22  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  70001      12      60015              6   120
32243 TUS M E      END    22  TASK      6  JOB     2 TI=706
32243 TUS MS       START   9  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60012      13      70001             24   120
32243 TUS M E      END     9  TASK      6  JOB     2 TI=706
32243 TUS MS       START  13  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001             32   120
32243 TUS M E      END    13  TASK      6  JOB     2 TI=706
32243 TUS MS       START  15  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60010      11      70001             34   120
32243 TUS M E      END    15  TASK      6  JOB     2 TI=706
32243 TUS MS       START  17  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001             30   120
32243 TUS M E      END    17  TASK      6  JOB     2 TI=706
32243 TUS MS       START  19  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60012      13      70001             14   120
32243 TUS M E      END    19  TASK      6  JOB     2 TI=706
32243 TUS MS       START  25  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60016      13      70001             26   120
32243 TUS M E      END    25  TASK      6  JOB     2 TI=706
32243 TUS MS       START  27  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60014      11      70001             12   120
32243 TUS M E      END    27  TASK      6  JOB     2 TI=706
32243 TUS MS       START   7  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001             56   120
32243 TUS M E      END     7  TASK      6  JOB     2 TI=706
32243 TUS MS       START  11  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001             28   120
32243 TUS M E      END    11  TASK      6  JOB     2 TI=706
32243 TUS MS       START  21  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001             14   120
32243 TUS M E      END    21  TASK      6  JOB     2 TI=706
32243 TUS MS       START  23  TASK      6  JOB     2 TI=706 LENGTH  RATE
                   PATH  60015      12      70001             18   120
32243 TUS M E      END    23  TASK      6  JOB     2 TI=706
32245 TUS M E      END    58  TASK      7  JOB     2 TI=707
32245 TUS    T   I INTERRUPT  TASK      6  JOB     2 TI=706
32245 TUS    T X   EXECUTING  TASK      7  JOB     2 TI=707
32245 TUS MS       START  28  TASK      7  JOB     2 TI=707 LENGTH  RATE
                   PATH  70003       1      70001            256   120
32245 TUS MS       START  29  TASK      7  JOB     2 TI=707 LENGTH  RATE
                   PATH  70001       2      70003            256   120
32247 TUS M E      END    28  TASK      7  JOB     2 TI=707
32247 TUS M E      END    29  TASK      7  JOB     2 TI=707
32247 TUS MS       START  28  TASK      7  JOB     2 TI=707 LENGTH  RATE
                   PATH  70002       1      70001            256   120
32247 TUS MS       START  29  TASK      7  JOB     2 TI=707 LENGTH  RATE
                   PATH  70001       2      70002            256   120
32249 TUS M E      END    28  TASK      7  JOB     2 TI=707
32249 TUS M E      END    29  TASK      7  JOB     2 TI=707
32249 TUS    T  E  END        TASK      7  JOB     2 TI=707
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32249 TUS     T X   EXECUTING  TASK      6  JOB      2 TI=706
32250 TUS M E       END    59  TASK     34  JOB      2 TI=723
32251 TUS MS        START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      10       60017              72   120
32251 TUS M E       END    54  TASK      6  JOB      2 TI=706
32251 TUS MS        START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      11       60010              52   120
32251 TUS M E       END    50  TASK      6  JOB      2 TI=706
32251 TUS MS        START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      11       60010               4   120
32251 TUS M E       END    52  TASK      6  JOB      2 TI=706
32251 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      12       60015              36   120
32251 TUS M E       END    53  TASK      6  JOB      2 TI=706
32251 TUS MS        START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      10       60013               2   120
32251 TUS M E       END    26  TASK      6  JOB      2 TI=706
32251 TUS MS        START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      11       60010              12   120
32251 TUS M E       END     6  TASK      6  JOB      2 TI=706
32251 TUS MS        START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      11       60010               2   120
32251 TUS M E       END    10  TASK      6  JOB      2 TI=706
32251 TUS MS        START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      11       60010               2   120
32251 TUS M E       END    20  TASK      6  JOB      2 TI=706
32251 TUS MS        START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      11       60014               6   120
32251 TUS M E       END    22  TASK      6  JOB      2 TI=706
32251 TUS MS        START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      10       60009              52   120
32251 TUS M E       END    50  TASK      6  JOB      2 TI=706
32251 TUS MS        START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      10       60009               4   120
32251 TUS M E       END    52  TASK      6  JOB      2 TI=706
32251 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      11       60014              36   120
32251 TUS M E       END    53  TASK      6  JOB      2 TI=706
32251 TUS MS        START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   60013      10       70001              12   120
32251 TUS M E       END    27  TASK      6  JOB      2 TI=706
32251 TUS MS        START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   60010      11       70001              56   120
32251 TUS M E       END     7  TASK      6  JOB      2 TI=706
32251 TUS MS        START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   60010      11       70001              28   120
32251 TUS M E       END    11  TASK      6  JOB      2 TI=706
32251 TUS MS        START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   60010      11       70001              14   120
32251 TUS M E       END    21  TASK      6  JOB      2 TI=706
32251 TUS MS        START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   60014      11       70001              18   120
32251 TUS M E       END    23  TASK      6  JOB      2 TI=706
32251 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      10       60013              36   120
32251 TUS M E       END    53  TASK      6  JOB      2 TI=706
32252 TUS MS        START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH   70001      10       60009              12   120
32252 TUS M E       END     6  TASK      6  JOB      2 TI=706
32252 TUS MS        START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
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                 PATH  70001      10       60009                2   120
32252 TUS M E    END    10  TASK      6  JOB      2 TI=706
32252 TUS MS     START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      10       60009                2   120
32252 TUS M E    END    20  TASK      6  JOB      2 TI=706
32252 TUS MS     START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      10       60013                6   120
32252 TUS M E    END    22  TASK      6  JOB      2 TI=706
32252 TUS MS     START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60009      10       70001               56   120
32252 TUS M E    END     7  TASK      6  JOB      2 TI=706
32252 TUS MS     START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60009      10       70001               28   120
32252 TUS M E    END    11  TASK      6  JOB      2 TI=706
32252 TUS MS     START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60009      10       70001               14   120
32252 TUS M E    END    21  TASK      6  JOB      2 TI=706
32252 TUS MS     START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60013      10       70001               18   120
32252 TUS M E    END    23  TASK      6  JOB      2 TI=706
32252 TUS  T  E  END        TASK      6  JOB      2 TI=706
32252 TUS  T X   EXECUTING  TASK      9  JOB      2 TI=709
32255 TUS  T  E  END        TASK      9  JOB      2 TI=709
32255 TUS  T X   EXECUTING  TASK     11  JOB      2 TI=711
32255 TUS MS     START  32  TASK     11  JOB      2 TI=711 LENGTH  RATE
                 PATH  70001      24       60095              256   120
32257 TUS M E    END    32  TASK     11  JOB      2 TI=711
32257 TUS MS     START  33  TASK     11  JOB      2 TI=711 LENGTH  RATE
                 PATH  60095      24       70001              256   120
32257 TUS  T  W  MSG WAIT   TASK     11  JOB      2 TI=711
32257 TUS  T X   EXECUTING  TASK     10  JOB      2 TI=710
32259 TUS M E    END    33  TASK     11  JOB      2 TI=711
32259 TUS  T  I  INTERRUPT  TASK     10  JOB      2 TI=710
32259 TUS  T X   EXECUTING  TASK     11  JOB      2 TI=711
32259 TUS  T  E  END        TASK     11  JOB      2 TI=711
32259 TUS  T X   EXECUTING  TASK     10  JOB      2 TI=710
32268 TUS  T  E  END        TASK     10  JOB      2 TI=710
32268 TUS  T X   EXECUTING  TASK     34  JOB      2 TI=723
32269 TUS  T  E  END        TASK     34  JOB      2 TI=723
32269 TUS  T X   EXECUTING  TASK     37  JOB      2 TI=725
32269 TUS  T  E  END        TASK     37  JOB      2 TI=725
32281 TUS  T X   EXECUTING  TASK      7  JOB      2 TI=707
32281 TUS MS     START  58  TASK      7  JOB      2 TI=707 LENGTH  RATE
                 PATH  70001      24       60095              512   120
32281 TUS MS     START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                 PATH  70004       1       70001              256   120
32281 TUS MS     START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                 PATH  70001       2       70004              256   120
32283 TUS M E    END    28  TASK      7  JOB      2 TI=707
32283 TUS M E    END    29  TASK      7  JOB      2 TI=707
z2283 TUS  T  W  MSG WAIT   TASK      7  JOB      2 TI=707
32283 TUS  T X   EXECUTING  TASK      6  JOB      2 TI=706
32283 TUS MS     START  51  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      13       60012               48   120
32283 TUS M E    END    51  TASK      6  JOB      2 TI=706
32283 TUS MS     START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      10       60018               72   120
32283 TUS M E    END    54  TASK      6  JOB      2 TI=706
32283 TUS MS     START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001      12       60011               52   120
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32283 TUS M E      END    50  TASK      6  JOB      2 TI=706
32283 TUS MS       START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011                4   120
32283 TUS M E      END    52  TASK      6  JOB      2 TI=706
32283 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      13      60016               36   120
32283 TUS M E      END    53  TASK      6  JOB      2 TI=706
32283 TUS MS       START   8  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      13      60012                2   120
32283 TUS M E      END     8  TASK      6  JOB      2 TI=706
32283 TUS MS       START  12  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009               12   120
32283 TUS M E      END    12  TASK      6  JOB      2 TI=706
32283 TUS MS       START  14  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60010               10   120
32283 TUS M E      END    14  TASK      6  JOB      2 TI=706
32283 TUS MS       START  16  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011               10   120
32283 TUS M E      END    16  TASK      6  JOB      2 TI=706
32283 TUS MS       START  18  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      13      60012                2   120
32283 TUS M E      END    18  TASK      6  JOB      2 TI=706
32283 TUS MS       START  24  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      13      60016                6   120
32283 TUS M E      END    24  TASK      6  JOB      2 TI=706
32283 TUS MS       START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60014                2   120
32283 TUS M E      END    26  TASK      6  JOB      2 TI=706
32283 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011               12   120
32283 TUS M E      END     6  TASK      6  JOB      2 TI=706
32283 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011                2   120
32283 TUS M E      END    10  TASK      6  JOB      2 TI=706
32283 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011                2   120
32283 TUS M E      END    20  TASK      6  JOB      2 TI=706
32283 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60015                6   120
32283 TUS M E      END    22  TASK      6  JOB      2 TI=706
32283 TUS MS       START   9  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012      13      70001               24   120
32283 TUS M E      END     9  TASK      6  JOB      2 TI=706
32283 TUS MS       START  13  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001               32   120
32283 TUS M E      END    13  TASK      6  JOB      2 TI=706
32283 TUS MS       START  15  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11      70001               34   120
32283 TUS M E      END    15  TASK      6  JOB      2 TI=706
32283 TUS MS       START  17  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001               30   120
32283 TUS M E      END    17  TASK      6  JOB      2 TI=706
32283 TUS MS       START  19  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012      13      70001               14   120
32283 TUS M E      END    19  TASK      6  JOB      2 TI=706
32283 TUS MS       START  25  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60016      13      70001               26   120
32283 TUS M E      END    25  TASK      6  JOB      2 TI=706
32283 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014      11      70001               12   120
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32283 TUS M E       END    27  TASK      6  JOB      2 TI=706
32283 TUS MS        START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60011      12       70001              56   120
32283 TUS M E       END     7  TASK      6  JOB      2 TI=706
32283 TUS MS        START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60011      12       70001              28   120
32283 TUS M E       END    11  TASK      6  JOB      2 TI=706
32283 TUS MS        START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60011      12       70001              14   120
32283 TUS M E       END    21  TASK      6  JOB      2 TI=706
32283 TUS MS        START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60015      12       70001              18   120
32283 TUS M E       END    23  TASK      6  JOB      2 TI=706
32285 TUS M E       END    58  TASK      7  JOB      2 TI=707
32285 TUS    T    I INTERRUPT  TASK      6  JOB      2 TI=706
32285 TUS    T X    EXECUTING  TASK      7  JOB      2 TI=707
32285 TUS MS        START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70003       1       70001             256   120
32285 TUS MS        START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001       2       70003             256   120
32287 TUS M E       END    28  TASK      7  JOB      2 TI=707
32287 TUS M E       END    29  TASK      7  JOB      2 TI=707
32287 TUS MS        START  26  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70002       1       70001             256   120
32287 TUS MS        START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001       2       70002             256   120
32289 TUS M E       END    28  TASK      7  JOB      2 TI=707
32289 TUS M E       END    29  TASK      7  JOB      2 TI=707
32289 TUS    T  E   END        TASK      7  JOB      2 TI=707
32289 TUS    T X    EXECUTING  TASK      6  JOB      2 TI=706
32289 TUS MS        START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60017              72   120
32289 TUS M E       END    54  TASK      6  JOB      2 TI=706
32289 TUS MS        START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60010              52   120
32289 TUS M E       END    50  TASK      6  JOB      2 TI=706
32289 TUS MS        START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60010               4   120
32289 TUS M E       END    52  TASK      6  JOB      2 TI=706
32289 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       6001.              36   120
32289 TUS M E       END    53  TASK      6  JOB      2 TI=706
32289 TUS MS        START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60013               2   120
32289 TUS M E       END    26  TASK      6  JOB      2 TI=706
32289 TUS MS        START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60010              12   120
32289 TUS M E       END     6  TASK      6  JOB      2 TI=706
32289 TUS MS        START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60010               2   120
32289 TUS M E       END    10  TASK      6  JOB      2 TI=706
32289 TUS MS        START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60010               2   120
32289 TUS M E       END    20  TASK      6  JOB      2 TI=706
32289 TUS MS        START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60014               6   120
32289 TUS M E       END    22  TASK      6  JOB      2 TI=706
32289 TUS MS        START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009              52   120
32289 TUS M E       END    50  TASK      6  JOB      2 TI=706
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32289 TUS MS      START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60009                4  120
32289 TUS M E     END    52  TASK      6  JOB      2 TI=706
32289 TUS MS      START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11       60014               36  120
32289 TUS M E     END    53  TASK      6  JOB      2 TI=706
32289 TUS MS      START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60013      10       70001               12  120
32289 TUS M E     END    27  TASK      6  JOB      2 TI=706
32289 TUS MS      START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11       70001               56  120
32289 TUS M E     END     7  TASK      6  JOB      2 TI=706
32289 TUS MS      START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11       70001               28  120
32289 TUS M E     END    11  TASK      6  JOB      2 TI=706
32289 TUS MS      START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11       70001               14  120
32289 TUS M E     END    21  TASK      6  JOB      2 TI=706
32289 TUS MS      START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60014      11       70001               18  120
32289 TUS M E     END    23  TASK      6  JOB      2 TI=706
32289 TUS MS      START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60013               36  120
32289 TUS M E     END    53  TASK      6  JOB      2 TI=706
32290 TUS MS      START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60009               12  120
32290 TUS M E     END     6  TASK      6  JOB      2 TI=706
32290 TUS MS      START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60009                2  120
32290 TUS M E     END    10  TASK      6  JOB      2 TI=706
32290 TUS MS      START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60009                2  120
32290 TUS M E     END    20  TASK      6  JOB      2 TI=706
32290 TUS MS      START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10       60013                6  120
32290 TUS M E     END    22  TASK      6  JOB      2 TI=706
32290 TUS MS      START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60009      10       70001               56  120
32290 TUS M E     END     7  TASK      6  JOB      2 TI=706
32290 TUS MS      START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60009      10       70001               28  120
32290 TUS M E     END    11  TASK      6  JOB      2 TI=706
32290 TUS MS      START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60009      10       70001               14  120
32290 TUS M E     END    21  TASK      6  JOB      2 TI=706
32290 TUS MS      START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60013      10       70001               18  120
32290 TUS M E     END    23  TASK      6  JOB      2 TI=706
32290 TUS    T  E EXECUTING TASK      6  JOB      2 TI=706
32290 TUS    T X  EXECUTING TASK      9  JOB      2 TI=709
32293 TUS    T  E END       TASK      9  JOB      2 TI=709
32301 TUS    T X  EXECUTING TASK     11  JOB      2 TI=711
32302 TUS MS      START  32  TASK     11  JOB      2 TI=711 LENGTH  RATE
                  PATH  70001      24       60095              256  120
32304 TUS M E     END    32  TASK     11  JOB      2 TI=711
32304 TUS MS      START  33  TASK     11  JOB      2 TI=711 LENGTH  RATE
                  PATH  60095      24       70001              256  120
32304 TUS    T  W MSG WAIT  TASK     11  JOB      2 TI=711
32304 TUS    T X  EXECUTING TASK     35  JOB      2 TI=724
32304 TUS MS      START  55  TASK     35  JOB      2 TI=724 LENGTH  RATE
                  PATH  70001       6       60001             1024  120
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32304 TUS MS        START  56  TASK      35  JOB      2 TI=724 LENGTH  RATE
                    PATH  70001       7       60002              1024   120
32304 TUS MS        START  57  TASK      35  JOB      2 TI=724 LENGTH  RATE
                    PATH  70001       8       60003              1024   120
32306 TUS M E       END    33  TASK      11  JOB      2 TI=711
32306 TUS    T    I INTERRUPT TASK      35  JOB      2 TI=724
32306 TUS    T X    EXECUTING TASK      11  JOB      2 TI=711
32306 TUS    T  E   END       TASK      11  JOB      2 TI=711
32306 TUS    T X    EXECUTING TASK      35  JOB      2 TI=724
32312 TUS M E       END    55  TASK      35  JOB      2 TI=724
32312 TUS M E       END    56  TASK      35  JOB      2 TI=724
32312 TUS M E       END    57  TASK      35  JOB      2 TI=724
32316 TUS    T  E   END       TASK      35  JOB      2 TI=724
32321 TUS    T X    EXECUTING TASK       7  JOB      2 TI=707
32321 TUS MS        START  58  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001      24       60095               512   120
32321 TUS MS        START  28  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70004       1       70001               256   120
32321 TUS MS        START  29  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001       2       70004               256   120
32323 TUS M E       END    28  TASK       7  JOB      2 TI=707
32323 TUS M E       END    29  TASK       7  JOB      2 TI=707
32323 TUS    T   W  MSG WAIT   TASK       7  JOB      2 TI=707
32323 TUS    T X    EXECUTING TASK       6  JOB      2 TI=706
32323 TUS MS        START  51  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012                48   120
32323 TUS M E       END    51  TASK       6  JOB      2 TI=706
32323 TUS MS        START  54  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60018                72   120
32323 TUS M E       END    54  TASK       6  JOB      2 TI=706
32323 TUS MS        START  50  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011                52   120
32323 TUS M E       END    50  TASK       6  JOB      2 TI=706
32323 TUS MS        START  52  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011                 4   120
32323 TUS M E       END    52  TASK       6  JOB      2 TI=706
32323 TUS MS        START  53  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60016                36   120
32323 TUS M E       END    53  TASK       6  JOB      2 TI=706
32323 TUS MS        START   8  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012                 2   120
32323 TUS M E       END     8  TASK       6  JOB      2 TI=706
32323 TUS MS        START  12  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009                12   120
32323 TUS M E       END    12  TASK       6  JOB      2 TI=706
32323 TUS MS        START  14  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60010                10   120
32323 TUS M E       END    14  TASK       6  JOB      2 TI=706
32323 TUS MS        START  16  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011                10   120
32323 TUS M E       END    16  TASK       6  JOB      2 TI=706
32323 TUS MS        START  18  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012                 2   120
32323 TUS M E       END    18  TASK       6  JOB      2 TI=706
32323 TUS MS        START  24  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60016                 6   120
32323 TUS M E       END    24  TASK       6  JOB      2 TI=706
32323 TUS MS        START  26  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60014                 2   120
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32323 TUS M E      END    26  TASK      6  JOB      2 TI=706
32323 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011              12   120
32323 TUS M E      END     6  TASK      6  JOB      2 TI=706
32323 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011               2   120
32323 TUS M E      END    10  TASK      6  JOB      2 TI=706
32323 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011               2   120
32323 TUS M E      END    20  TASK      6  JOB      2 TI=706
32323 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60015               6   120
32323 TUS M E      END    22  TASK      6  JOB      2 TI=706
32323 TUS MS       START   9  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012      13      70001              24   120
32323 TUS M E      END     9  TASK      6  JOB      2 TI=706
32323 TUS MS       START  13  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001              32   120
32323 TUS M E      END    13  TASK      6  JOB      2 TI=706
32323 TUS MS       START  15  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11      70001              34   120
32323 TUS M E      END    15  TASK      6  JOB      2 TI=706
32323 TUS MS       START  17  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001              30   120
32323 TUS M E      END    17  TASK      6  JOB      2 TI=706
32323 TUS MS       START  19  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012      13      70001              14   120
32323 TUS M E      END    19  TASK      6  JOB      2 TI=706
32323 TUS MS       START  25  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60016      13      70001              26   120
32323 TUS M E      END    25  TASK      6  JOB      2 TI=706
32323 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014      11      70001              12   120
32323 TUS M E      END    27  TASK      6  JOB      2 TI=706
32323 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001              56   120
32323 TUS M E      END     7  TASK      6  JOB      2 TI=706
32323 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001              28   120
32323 TUS M E      END    11  TASK      6  JOB      2 TI=706
32323 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001              14   120
32323 TUS M E      END    21  TASK      6  JOB      2 TI=706
32323 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60015      12      70001              18   120
32323 TUS M E      END    23  TASK      6  JOB      2 TI=706
32325 TUS M E      END    58  TASK      7  JOB      2 TI=707
32325 TUS    T   I INTERRUPT  TASK      6  JOB      2 TI=706
32325 TUS    T X   EXECUTING  TASK      7  JOB      2 TI=707
32325 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70003       1      70001             256   120
32325 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001       2      70003             256   120
32327 TUS M E      END    28  TASK      7  JOB      2 TI=707
32327 TUS M E      END    29  TASK      7  JOB      2 TI=707
32327 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70002       1      70001             256   120
32327 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001       2      70002             256   120
32329 TUS M E      END    28  TASK      7  JOB      2 TI=707
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32329 TUS M E      END    29  TASK      7  JOB      2 TI=707
32329 TUS    T  E  END        TASK      7  JOB      2 TI=707
32329 TUS    T X   EXECUTING  TASK      6  JOB      2 TI=706
32331 TUS MS       START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      10       60017              72   120
32331 TUS M E      END    54  TASK      6  JOB      2 TI=706
32331 TUS MS       START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      11       60010              52   120
32331 TUS M E            50  TASK      6  JOB      2 TI=706
32331 TUS MS           T  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                      70001      11       60010               4   120
32331 TUS M E      E.     52  TASK      6  JOB      2 TI=706
32331 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      12       60015              36   120
32331 TUS M E      END    53  TASK      6  JOB      2 TI=706
32331 TUS MS       START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      10       60013               2   120
32331 TUS M E      END    26  TASK      6  JOB      2 TI=706
32331 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      11       60010              12   120
32331 TUS M E      END     6  TASK      6  JOB      2 TI=706
32331 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      11       60010               2   120
32331 TUS M E      END    10  TASK      6  JOB      2 TI=706
32331 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      11       60010               2   120
32331 TUS M E      END    20  TASK      6  JOB      2 TI=706
32331 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      11       60014               6   120
32331 TUS M E      END    22  TASK      6  JOB      2 TI=706
32331 TUS MS       START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      10       60009              52   120
32331 TUS M E      END    50  TASK      6  JOB      2 TI=706
32331 TUS MS       START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      10       60009               4   120
32331 TUS M E      END    52  TASK      6  JOB      2 TI=706
32331 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      11       60014              36   120
32331 TUS M E      END    53  TASK      6  JOB      2 TI=706
32331 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   60013      10       70001              12   120
32331 TUS M E      END    27  TASK      6  JOB      2 TI=706
32331 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   60010      11       70001              56   120
32331 TUS M E      END     7  TASK      6  JOB      2 TI=706
32331 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   60010      11       70001              28   120
32331 TUS M E      END    11  TASK      6  JOB      2 TI=706
32331 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   60010      11       70001              14   120
32331 TUS M E      END    21  TASK      6  JOB      2 TI=706
32331 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   60014      11       70001              18   120
32331 TUS M E      END    23  TASK      6  JOB      2 TI=706
32331 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      10       60013              36   120
32331 TUS M E      END    53  TASK      6  JOB      2 TI=706
32332 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH   70001      10       60009              12   120
32332 TUS M E      END     6  TASK      6  JOB      2 TI=706
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32332 TUS MS        START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009              2   120
32332 TUS M E       END    10  TASK      6  JOB      2 TI=706
32332 TUS MS        START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009              2   120
32332 TUS M E       END    20  TASK      6  JOB      2 TI=706
32332 TUS MS        START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60013              6   120
32332 TUS M E       END    22  TASK      6  JOB      2 TI=706
32332 TUS MS        START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001             56   120
32332 TUS M E       END     7  TASK      6  JOB      2 TI=706
32332 TUS MS        START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001             28   120
32332 TUS M E       END    11  TASK      6  JOB      2 TI=706
32332 TUS MS        START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001             14   120
32332 TUS M E       END    21  TASK      6  JOB      2 TI=706
32332 TUS MS        START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60013      10       70001             18   120
32332 TUS M E       END    23  TASK      6  JOB      2 TI=706
32332 TUS    T  E   END        TASK      6  JOB      2 TI=706
32332 TUS    T X    EXECUTING  TASK      9  JOB      2 TI=709
32334 TUS    T  E   END        TASK      9  JOB      2 TI=709
32334 TUS    T X    EXECUTING  TASK     10  JOB      2 TI=710
32345 TUS    T  E   END        TASK     10  JOB      2 TI=710
32345 TUS    T X    EXECUTING  TASK     19  JOB      2 TI=716
32350 TUS    T    I INTERRUPT  TASK     19  JOB      2 TI=716
32350 TUS    T X    EXECUTING  TASK     13  JOB      2 TI=713
32350 TUS    T X    EXECUTING  TASK     14  JOB      2 TI=714
32350 TUS    T  E   END        TASK     13  JOB      2 TI=713
32350 TUS    T  E   END        TASK     14  JOB      2 TI=714
32350 TUS    T X    EXECUTING  TASK     34  JOB      2 TI=723
32350 TUS MS        START  59  TASK     34  JOB      2 TI=723 LENGTH  RATE
                    PATH  60027      10       70001             10     1
32351 TUS    T    I INTERRUPT  TASK     34  JOB      2 TI=723
32351 TUS    T X    EXECUTING  TASK     11  JOB      2 TI=711
32352 TUS MS        START  32  TASK     11  JOB      2 TI=711 LENGTH  RATE
                    PATH  70001      24       60095             256   120
32354 TUS M E       END    32  TASK      1  JOB      2 TI=711
32354 TUS MS        START  33  TASK     11  JOB      2 TI=711 LENGTH  RATE
                    PATH  60095      24       70001             256   120
32354 TUS    T   W  MSG WAIT   TASK     11  JOB      2 TI=711
32354 TUS    T X    EXECUTING  TASK     34  JOB      2 TI=723
32355 TUS    T   W  MSG WAIT   TASK     34  JOB      2 TI=723
32355 TUS    T X    EXECUTING  TASK     19  JOB      2 TI=716
32356 TUS M E       END    33  TASK     11  JOB      2 TI=711
32356 TUS    T    I INTERRUPT  TASK     19  JOB      2 TI=716
32356 TUS    T X    EXECUTING  TASK     11  JOB      2 TI=711
32356 TUS    T  E   END        TASK     11  JOB      2 TI=711
32356 TUS    T X    EXECUTING  TASK     19  JOB      2 TI=716
32358 TUS    T  E   END        TASK     19  JOB      2 TI=716
32360 TUS M E       END    59  TASK     34  JOB      2 TI=723
32360 TUS    T X    EXECUTING  TASK     34  JOB      2 TI=723
32360 TUS    T  E   END        TASK     34  JOB      2 TI=723
32361 TUS    T X    EXECUTING  TASK      7  JOB      2 TI=707
32361 TUS MS        START  58  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001      24       60095             512   120
32361 TUS MS        START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70004       1       70001             256   120
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32361 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70001        2      70004              256   120
32363 TUS M E      END    28  TASK      7  JOB      2 TI=707
32363 TUS M E      END    29  TASK      7  JOB      2 TI=707
32364 TUS    T   W MSG WAIT   TASK      7  JOB      2 TI=707
32364 TUS    T X   EXECUTING  TASK      6  JOB      2 TI=706
32364 TUS MS       START  51  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       13      60012               48   120
32364 TUS M E      END    51  TASK      6  JOB      2 TI=706
32364 TUS MS       START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       10      60018               72   120
32364 TUS M E      END    54  TASK      6  JOB      2 TI=706
32364 TUS MS       START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12      60011               52   120
32364 TUS M E      END    50  TASK      6  JOB      2 TI=706
32364 TUS MS       START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12      60011                4   120
32364 TUS M E      END    52  TASK      6  JOB      2 TI=706
32364 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       13      60016               36   120
32364 TUS M E      END    53  TASK      6  JOB      2 TI=706
32364 TUS MS       START   8  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       13      60012                2   120
32364 TUS M E      END     8  TASK      6  JOB      2 TI=706
32364 TUS MS       START  12  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       10      60009               12   120
32364 TUS M E      END    12  TASK      6  JOB      2 TI=706
32364 TUS MS       START  14  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60010               10   120
32364 TUS M E      END    14  TASK      6  JOB      2 TI=706
32364 TUS MS       START  16  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12      60011               10   120
32364 TUS M E      END    16  TASK      6  JOB      2 TI=706
32364 TUS MS       START  18  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       13      60012                2   120
32364 TUS M E      END    18  TASK      6  JOB      2 TI=706
32364 TUS MS       START  24  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       13      60016                6   120
32364 TUS M E      END    24  TASK      6  JOB      2 TI=706
32364 TUS MS       START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       11      60014                2   120
32364 TUS M E      END    26  TASK      6  JOB      2 TI=706
32364 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12      60011               12   120
32364 TUS M E      END     6  TASK      6  JOB      2 TI=706
32364 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12      60011                2   120
32364 TUS M E      END    10  TASK      6  JOB      2 TI=706
32364 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12      60011                2   120
32364 TUS M E      END    20  TASK      6  JOB      2 TI=706
32364 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001       12      60015                6   120
32364 TUS M E      END    22  TASK      6  JOB      2 TI=706
32364 TUS MS       START   9  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012       13      70001               24   120
32364 TUS M E      END     9  TASK      6  JOB      2 TI=706
32364 TUS MS -     START  13  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009       10      70001               32   120
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32364 TUS M E      END    13  TASK      6  JOB      2 TI=706
32364 TUS MS       START  15  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  60010      11      70001              34    120
32364 TUS M E      END    15  TASK      6  JOB      2 TI=706
32364 TUS MS       START  17  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  60011      12      70001              30    120
32364 TUS M E      END    17  TASK      6  JOB      2 TI=706
32364 TUS MS       START  19  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  60012      13      70001              14    120
32364 TUS M E      END    19  TASK      6  JOB      2 TI=706
32364 TUS MS       START  25  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  60016      13      70001              26    120
32364 TUS M E      END    25  TASK      6  JOB      2 TI=706
32364 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  60014      11      70001              12    120
32364 TUS M E      END    27  TASK      6  JOB      2 TI=706
32364 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  60011      12      70001              56    120
32364 TUS M E      END     7  TASK      6  JOB      2 TI=706
32364 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  60011      12      70001              28    120
32364 TUS M E      END    11  TASK      6  JOB      2 TI=706
32364 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  60011      12      70001              14    120
32364 TUS M E      END    21  TASK      6  JOB      2 TI=706
32364 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  60015      12      70001              18    120
32364 TUS M E      END    23  TASK      6  JOB      2 TI=706
32365 TUS M E      END    58  TASK      7  JOB      2 TI=707
32365 TUS    T   I INTERRUPT  TASK      6  JOB      2 TI=706
32365 TUS    T X   EXECUTING  TASK      7  JOB      2 TI=707
32365 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH   RATE
                   PATH  70003       1      70001             256    120
32365 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH   RATE
                   PATH  70001       2      70003             256    120
32367 TUS M E      END    28  TASK      7  JOB      2 TI=707
32367 TUS M E      END    29  TASK      7  JOB      2 TI=707
32367 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH   RATE
                   PATH  70002       1      70001             256    120
32367 TUS MS       START  29  TASK      7  JOB      2 TI=707 LENGTH   RATE
                   PATH  70001       2      70002             256    120
32369 TUS M E      END    28  TASK      7  JOB      2 TI=707
32369 TUS M E      END    29  TASK      7  JOB      2 TI=707
32369 TUS    T  E  END        TASK      7  JOB      2 TI=707
32369 TUS    T X   EXECUTING  TASK      6  JOB      2 TI=706
32370 TUS MS       START  54  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  70001      10      60017              72    120
32370 TUS M E      END    54  TASK      6  JOB      2 TI=706
32370 TUS MS       START  50  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  70001      11      60010              52    120
32370 TUS M E      END    50  TASK      6  JOB      2 TI=706
32370 TUS MS       START  52  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  70001      11      60010               4    120
32370 TUS M E      END    52  TASK      6  JOB      2 TI=706
32370 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  70001      12      60015              36    120
32370 TUS M E      END    53  TASK      6  JOB      2 TI=706
32370 TUS MS       START  26  TASK      6  JOB      2 TI=706 LENGTH   RATE
                   PATH  70001      10      60013               2    120
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32370 TUS M E    END    26  TASK      6  JOB      2 TI=706
32370 TUS MS     START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       11      60010              12   120
32370 TUS M E    END     6  TASK      6  JOB      2 TI=706
32370 TUS MS     START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       11      60010               2   120
32370 TUS M E    END    10  TASK      6  JOB      2 TI=706
32370 TUS MS     START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       11      60010               2   120
32370 TUS M E    END    20  TASK      6  JOB      2 TI=706
32370 TUS MS     START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       11      60014               6   120
32370 TUS M E    END    22  TASK      6  JOB      2 TI=706
32370 TUS MS     START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       10      60009              52   120
32370 TUS M E    END    50  TASK      6  JOB      2 TI=706
32370 TUS MS     START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       10      60009               4   120
32370 TUS M E    END    52  TASK      6  JOB      2 TI=706
32370 TUS MS     START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       11      60014              36   120
32370 TUS M E    END    53  TASK      6  JOB      2 TI=706
32370 TUS MS     START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60013       10      70001              12   120
32370 TUS M E    END    27  TASK      6  JOB      2 TI=706
32370 TUS MS     START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60010       11      70001              56   120
32370 TUS M E    END     7  TASK      6  JOB      2 TI=706
32370 TUS MS     START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60010       11      70001              28   120
32370 TUS M E    END    11  TASK      6  JOB      2 TI=706
32370 TUS MS     START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60010       11      70001              14   120
32370 TUS M E    END    21  TASK      6  JOB      2 TI=706
32370 TUS MS     START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60014       11      70001              18   120
32370 TUS M E    END    23  TASK      6  JOB      2 TI=706
32370 TUS MS     START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       10      60013              36   120
32370 TUS M E    END    53  TASK      6  JOB      2 TI=706
32371 TUS MS     START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       10      60009              12   120
32371 TUS M E    END     6  TASK      6  JOB      2 TI=706
32371 TUS MS     START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       10      60009               2   120
32371 TUS M E    END    10  TASK      6  JOB      2 TI=706
32371 TUS MS     START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       10      60009               2   120
32371 TUS M E    END    20  TASK      6  JOB      2 TI=706
32371 TUS MS     START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  70001       10      60013               6   120
32371 TUS M E    END    22  TASK      6  JOB      2 TI=706
32371 TUS MS     START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60009       10      70001              56   120
32371 TUS M E    END     7  TASK      6  JOB      2 TI=706
32371 TUS MS     START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60009       10      70001              28   120
32371 TUS M E    END    11  TASK      6  JOB      2 TI=706
32371 TUS MS     START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                 PATH  60009       10      70001              14   120
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32371 TUS M E       END    21  TASK      6  JOB      2 TI=706
32371 TUS MS        START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60013      10       70001              18   120
32371 TUS M E       END    23  TASK      6  JOB      2 TI=706
32371 TUS     T  E  END        TASK      6  JOB      2 TI=706
32371 TUS     T X   EXECUTING  TASK      9  JOB      2 TI=709
32374 TUS     T  E  END        TASK      9  JOB      2 TI=709
32375 TUS     T X   EXECUTING  TASK     14  JOB      2 TI=714
32375 TUS     T  E  END        TASK     14  JOB      2 TI=714
32375 TUS     T X   EXECUTING  TASK     34  JOB      2 TI=723
32375 TUS MS        START  59  TASK     34  JOB      2 TI=723 LENGTH  RATE
                    PATH  60027       0       70001              10     1
32377 TUS     T   W MSG WAIT   TASK     34  JOB      2 TI=723
32385 TUS M E       END    59  TASK     34  JOB      2 TI=723
32385 TUS     T X   EXECUTING  TASK     34  JOB      2 TI=723
32385 TUS     T  E  END        TASK     34  JOB      2 TI=723
32400 TUS     T X   EXECUTING  TASK     13  JOB      2 TI=713
32400 TUS     T X   EXECUTING  TASK     14  JOB      2 TI=714
32400 TUS     T  E  END        TASK     13  JOB      2 TI=713
32400 TUS     T  E  END        TASK     14  JOB      2 TI=714
32400 TUS     T X   EXECUTING  TASK     34  JOB      2 TI=723
32400 TUS MS        START  59  TASK     34  JOB      2 TI=723 LENGTH  RATE
                    PATH  60027       0       70001              10     1
32401 TUS     T    I INTERRUPT  TASK     34  JOB      2 TI=723
32401 TUS     T X   EXECUTING  TASK      7  JOB      2 TI=707
32401 TUS MS        START  58  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001      24       60095             512   120
32401 TUS MS        START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70004       1       70001             256   120
32401 TUS MS        START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001       2       70004             256   120
32403 TUS M E       END    28  TASK      7  JOB      2 TI=707
32403 TUS M E       END    29  TASK      7  JOB      2 TI=707
32403 TUS     T   W MSG WAIT   TASK      7  JOB      2 TI=707
32403 TUS     T X   EXECUTING  TASK      6  JOB      2 TI=706
32403 TUS MS        START  51  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012              48   120
32403 TUS M E       END    51  TASK      6  JOB      2 TI=706
32403 TUS MS        START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60018              72   120
32403 TUS M E       END    54  TASK      6  JOB      2 TI=706
32403 TUS MS        START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011              52   120
32403 TUS M E       END    50  TASK      6  JOB      2 TI=706
32403 TUS MS        START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011               4   120
32403 TUS M E       END    52  TASK      6  JOB      2 TI=706
32403 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60016              36   120
32403 TUS M E       END    53  TASK      6  JOB      2 TI=706
32403 TUS MS        START   8  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012               2   120
32403 TUS M E       END     8  TASK      6  JOB      2 TI=706
32403 TUS MS        START  12  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009              12   120
32403 TUS M E       END    12  TASK      6  JOB      2 TI=706
32403 TUS MS        START  14  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      11       60010              10   120
32403 TUS M E       END    14  TASK      6  JOB      2 TI=706
32403 TUS MS        START  16  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011              10   120
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32403 TUS M E      END    16  TASK      6  JOB      2 TI=706
32403 TUS MS       START  18  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      13      60012                2   120
32403 TUS M E      END    18  TASK      6  JOB      2 TI=706
32403 TUS MS       START  24  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      13      60016                6   120
32403 TUS M E      END    24  TASK      6  JOB      2 TI=706
32403 TUS MS       START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60014                2   120
32403 TUS M E      END    26  TASK      6  JOB      2 TI=706
32403 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011               12   120
32403 TUS M E      END     6  TASK      6  JOB      2 TI=706
32403 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011                2   120
32403 TUS M E      END    10  TASK      6  JOB      2 TI=706
32403 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60011                2   120
32403 TUS M E      END    20  TASK      6  JOB      2 TI=706
32403 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60015                6   120
32403 TUS M E      END    22  TASK      6  JOB      2 TI=706
32403 TUS MS       START   9  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012      13      70001               24   120
32403 TUS M E      END     9  TASK      6  JOB      2 TI=706
32403 TUS MS       START  13  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001               32   120
32403 TUS M E      END    13  TASK      6  JOB      2 TI=706
32403 TUS MS       START  15  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60010      11      70001               34   120
32403 TUS M E      END    15  TASK      6  JOB      2 TI=706
32403 TUS MS       START  17  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001               30   120
32403 TUS M E      END    17  TASK      6  JOB      2 TI=706
32403 TUS MS       START  19  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60012      13      70001               14   120
32403 TUS M E      END    19  TASK      6  JOB      2 TI=706
32403 TUS MS       START  25  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60016      13      70001               26   120
32403 TUS M E      END    25  TASK      6  JOB      2 TI=706
32403 TUS MS       START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014      11      70001               12   120
32403 TUS M E      END    27  TASK      6  JOB      2 TI=706
32403 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001               56   120
32403 TUS M E      END     7  TASK      6  JOB      2 TI=706
32403 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001               28   120
32403 TUS M E      END    11  TASK      6  JOB      2 TI=706
32403 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60011      12      70001               14   120
32403 TUS M E      END    21  TASK      6  JOB      2 TI=706
32403 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60015      12      70001               18   120
32403 TUS M E      END    23  TASK      6  JOB      2 TI=706
32405 TUS M E      END    58  TASK      7  JOB      2 TI=707
32405 TUS    T   I INTERRUPT  TASK      6  JOB      2 TI=706
32405 TUS    T X   EXECUTING  TASK      7  JOB      2 TI=707
32405 TUS MS       START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                   PATH  70003       1      70001              256   120
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32405 TUS MS      START  29  TASK      7  JOB     2 TI=707 LENGTH  RATE
                  PATH  70001      2       70003              256   120
32407 TUS M E     END    28  TASK      7  JOB     2 TI=707
32407 TUS M E     END    29  TASK      7  JOB     2 TI=707
32407 TUS MS      START  28  TASK      7  JOB     2 TI=707 LENGTH  RATE
                  PATH  70002      1       70001              256   120
32407 TUS MS      START  29  TASK      7  JOB     2 TI=707 LENGTH  RATE
                  PATH  70001      2       70002              256   120
32409 TUS M E     END    28  TASK      7  JOB     2 TI=707
32409 TUS M E     END    29  TASK      7  JOB     2 TI=707
32409 TUS   T  E  END        TASK      7  JOB     2 TI=707
32409 TUS   T X   EXECUTING  TASK      6  JOB     2 TI=706
32410 TUS M E     END    59  TASK     34  JOB     2 TI=723
32411 TUS MS      START  54  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     10       60017               72   120
32411 TUS M E     END    54  TASK      6  JOB     2 TI=706
32411 TUS MS      START  50  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     11       60010               52   120
32411 TUS M E     END    50  TASK      6  JOB     2 TI=706
32411 TUS MS      START  52  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     11       60010                4   120
32411 TUS M E     END    52  TASK      6  JOB     2 TI=706
32411 TUS MS      START  53  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     12       60015               36   120
32411 TUS M E     END    53  TASK      6  JOB     2 TI=706
32411 TUS MS      START  26  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     10       60013                2   120
32411 TUS M E     END    26  TASK      6  JOB     2 TI=706
32411 TUS MS      START   6  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     11       60010               12   120
32411 TUS M E     END     6  TASK      6  JOB     2 TI=706
32411 TUS MS      START  10  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     11       60010                2   120
32411 TUS M E     END    10  TASK      6  JOB     2 TI=706
32411 TUS MS      START  20  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     11       60010                2   120
32411 TUS M E     END    20  TASK      6  JOB     2 TI=706
32411 TUS MS      START  22  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     11       60014                6   120
32411 TUS M E     END    22  TASK      6  JOB     2 TI=706
32411 TUS MS      START  50  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     10       60009               52   120
32411 TUS M E     END    50  TASK      6  JOB     2 TI=706
32411 TUS MS      START  52  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     10       60009                4   120
32411 TUS M E     END    52  TASK      6  JOB     2 TI=706
32411 TUS MS      START  53  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  70001     11       60014               36   120
32411 TUS M E     END    53  TASK      6  JOB     2 TI=706
32411 TUS MS      START  27  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60013     10       70001               12   120
32411 TUS M E     END    27  TASK      6  JOB     2 TI=706
32411 TUS MS      START   7  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60010     11       70001               56   120
32411 TUS M E     END     7  TASK      6  JOB     2 TI=706
32411 TUS MS      START  11  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60010     11       70001               28   120
32411 TUS M E     END    11  TASK      6  JOB     2 TI=706
32411 TUS MS      START  21  TASK      6  JOB     2 TI=706 LENGTH  RATE
                  PATH  60010     11       70001               14   120
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32411 TUS M E      END    21  TASK      6  JOB      2 TI=706
32411 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60014      11      70001              18   120
32411 TUS M E      END    23  TASK      6  JOB      2 TI=706
32411 TUS MS       START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60013              36   120
32411 TUS M E      END    53  TASK      6  JOB      2 TI=706
32412 TUS MS       START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009              12   120
32412 TUS M E      END     6  TASK      6  JOB      2 TI=706
32412 TUS MS       START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009               2   120
32412 TUS M E      END    10  TASK      6  JOB      2 TI=706
32412 TUS MS       START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009               2   120
32412 TUS M E      END    20  TASK      6  JOB      2 TI=706
32412 TUS MS       START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60013               6   120
32412 TUS M E      END    22  TASK      6  JOB      2 TI=706
32412 TUS MS       START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001              56   120
32412 TUS M E      END     7  TASK      6  JOB      2 TI=706
32412 TUS MS       START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001              28   120
32412 TUS M E      END    11  TASK      6  JOB      2 TI=706
32412 TUS MS       START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60009      10      70001              14   120
32412 TUS M E      END    21  TASK      6  JOB      2 TI=706
32412 TUS MS       START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                   PATH  60013      10      70001              18   120
32412 TUS M E      END    23  TASK      6  JOB      2 TI=706
32412 TUS    T  E  END        TASK      6  JOB      2 TI=706
32412 TUS    T X   EXECUTING  TASK      9  JOB      2 TI=709
32414 TUS    T  E  END        TASK      9  JOB      2 TI=709
32414 TUS    T X   EXECUTING  TASK     32  JOB      2 TI=722
32415 TUS    T X   EXECUTING  TASK     11  JOB      2 TI=711
32415 TUS    T  E  END        TASK     32  JOB      2 TI=722
32415 TUS MS       START  32  TASK     11  JOB      2 TI=711 LENGTH  RATE
                   PATH  70001      24      60095             256   120
32417 TUS M E      END    32  TASK     11  JOB      2 TI=711
32417 TUS MS       START  33  TASK     11  JOB      2 TI=711 LENGTH  RATE
                   PATH  60095      24      70001             256   120
32417 TUS    T  W  MSG WAIT   TASK     11  JOB      2 TI=711
32417 TUS    T X   EXECUTING  TASK     10  JOB      2 TI=710
32419 TUS M E      END    33  TASK     11  JOB      2 TI=711
32419 TUS    T   I INTERRUPT  TASK     10  JOB      2 TI=710
32419 TUS    T X   EXECUTING  TASK     11  JOB      2 TI=711
32419 TUS    T  E  END        TASK     11  JOB      2 TI=711
32419 TUS    T X   EXECUTING  TASK     10  JOB      2 TI=710
32428 TUS    T  E  END        TASK     10  JOB      2 TI=710
32428 TUS    T X   EXECUTING  TASK     34  JOB      2 TI=723
32429 TUS    T  E  END        TASK     34  JOB      2 TI=723
32429 TUS    T X   EXECUTING  TASK     35  JOB      2 TI=724
32429 TUS MS       START  55  TASK     35  JOB      2 TI=724 LENGTH  RATE
                   PATH  70001       6      60001            1024   120
32429 TUS MS       START  56  TASK     35  JOB      2 TI=724 LENGTH  RATE
                   PATH  70001       7      60002            1024   120
32429 TUS MS       START  57  TASK     35  JOB      2 TI=724 LENGTH  RATE
                   PATH  70001       8      60003            1024   120
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32437 TUS M E       END    55  TASK      35  JOB      2 TI=724
32437 TUS M E       END    56  TASK      35  JOB      2 TI=724
32437 TUS M E       END    57  TASK      35  JOB      2 TI=724
32441 TUS    T    I INTERRUPT  TASK      35  JOB      2 TI=724
32441 TUS    T X    EXECUTING  TASK       7  JOB      2 TI=707
32441 TUS MS        START  58  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001        24       60095              512   120
32441 TUS MS        START  28  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70004         1       70001              256   120
32441 TUS MS        START  29  TASK       7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001         2       70004              256   120
32443 TUS M E       END    28  TASK       7  JOB      2 TI=707
32443 TUS M E       END    29  TASK       7  JOB      2 TI=707
32443 TUS    T   W  MSG WAIT  TASK       7  JOB      2 TI=707
32443 TUS    T X    EXECUTING  TASK       6  JOB      2 TI=706
32443 TUS MS        START  51  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        13       60012               48   120
32443 TUS M E       END    51  TASK       6  JOB      2 TI=706
32443 TUS MS        START  54  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        10       60018               72   120
32443 TUS M E       END    54  TASK       6  JOB      2 TI=706
32443 TUS MS        START  50  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        12       60011               52   120
32443 TUS M E       END    50  TASK       6  JOB      2 TI=706
32443 TUS MS        START  52  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        12       60011                4   120
32443 TUS M E       END    52  TASK       6  JOB      2 TI=706
32443 TUS MS        START  53  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        13       60016               36   120
32443 TUS M E       END    53  TASK       6  JOB      2 TI=706
32443 TUS MS        START   8  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        13       60012                2   120
32443 TUS M E       END     8  TASK       6  JOB      2 TI=706
32443 TUS MS        START  12  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        10       60009               12   120
32443 TUS M E       END    12  TASK       6  JOB      2 TI=706
32443 TUS MS        START  14  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        11       60010               10   120
32443 TUS M E       END    14  TASK       6  JOB      2 TI=706
32443 TUS MS        START  16  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        12       60011               10   120
32443 TUS M E       END    16  TASK       6  JOB      2 TI=706
32443 TUS MS        START  18  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        13       60012                2   120
32443 TUS M E       END    18  TASK       6  JOB      2 TI=706
32443 TUS MS        START  24  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        13       60016                6   120
32443 TUS M E       END    24  TASK       6  JOB      2 TI=706
32443 TUS MS        START  26  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        11       60014                2   120
32443 TUS M E       END    26  TASK       6  JOB      2 TI=706
32443 TUS MS        START   6  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        12       60011               12   120
32443 TUS M E       END     6  TASK       6  JOB      2 TI=706
32443 TUS MS        START  10  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        12       60011                2   120
32443 TUS M E       END    10  TASK       6  JOB      2 TI=706
32443 TUS MS        START  20  TASK       6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001        12       60011                2   120
32443 TUS M E       END    20  TASK       6  JOB      2 TI=706
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32443 TUS MS      START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      12      60015                6   120
32443 TUS M E     END    22  TASK      6  JOB      2 TI=706
32443 TUS MS      START   9  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60012      13      70001               24   120
32443 TUS M E     END     9  TASK      6  JOB      2 TI=706
32443 TUS MS      START  13  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60009      10      70001               32   120
32443 TUS M E     END    13  TASK      6  JOB      2 TI=706
32443 TUS MS      START  15  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11      70001               34   120
32443 TUS M E     END    15  TASK      6  JOB      2 TI=706
32443 TUS MS      START  17  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001               30   120
32443 TUS M E     END    17  TASK      6  JOB      2 TI=706
32443 TUS MS      START  19  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60012      13      70001               14   120
32443 TUS M E     END    19  TASK      6  JOB      2 TI=706
32443 TUS MS      START  25  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60016      13      70001               26   120
32443 TUS M E     END    25  TASK      6  JOB      2 TI=706
32443 TUS MS      START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60014      11      70001               12   120
32443 TUS M E     END    27  TASK      6  JOB      2 TI=706
32443 TUS MS      START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001               56   120
32443 TUS M E     END     7  TASK      6  JOB      2 TI=706
32443 TUS MS      START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001               28   120
32443 TUS M E     END    11  TASK      6  JOB      2 TI=706
32443 TUS MS      START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001               14   120
32443 TUS M E     END    21  TASK      6  JOB      2 TI=706
32443 TUS MS      START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60015      12      70001               18   120
32443 TUS M E     END    23  TASK      6  JOB      2 TI=706
32444 TUS MS      START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10      60017               72   120
32444 TUS M E     END    54  TASK      6  JOB      2 TI=706
32444 TUS MS      START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11      60010               52   120
32444 TUS M E     END    50  TASK      6  JOB      2 TI=706
32444 TUS MS      START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11      60010                4   120
32444 TUS M E     END    52  TASK      6  JOB      2 TI=706
32444 TUS MS      START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      12      60015               36   120
32444 TUS M E     END    53  TASK      6  JOB      2 TI=706
32444 TUS MS      START  26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10      60013                2   120
32444 TUS M E     END    26  TASK      6  JOB      2 TI=706
32444 TUS MS      START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11      60010               12   120
32444 TUS M E     END     6  TASK      6  JOB      2 TI=706
32444 TUS MS      START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11      60010                2   120
32444 TUS M E     END    10  TASK      6  JOB      2 TI=706
32444 TUS MS      START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11      60010                2   120
32444 TUS M E     END    20  TASK      6  JOB      2 TI=706
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32444 TUS MS      START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11      60014                6   120
32444 TUS M E     END    22  TASK      6  JOB      2 TI=706
32444 TUS MS      START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10      60009               52   120
32444 TUS M E     END    50  TASK      6  JOB      2 TI=706
32444 TUS MS      START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10      60009                4   120
32444 TUS M E     END    52  TASK      6  JOB      2 TI=706
32444 TUS MS      START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11      60014               36   120
32444 TUS M E     END    53  TASK      6  JOB      2 TI=706
32444 TUS MS      START  27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60013      10      70001               12   120
32444 TUS M E     END    27  TASK      6  JOB      2 TI=706
32444 TUS MS      START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11      70001               56   120
32444 TUS M E     END     7  TASK      6  JOB      2 TI=706
32444 TUS MS      START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11      70001               28   120
32444 TUS M E     END    11  TASK      6  JOB      2 TI=706
32444 TUS MS      START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11      70001               14   120
32444 TUS M E     END    21  TASK      6  JOB      2 TI=706
32444 TUS MS      START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60014      11      70001               18   120
32444 TUS M E     END    23  TASK      6  JOB      2 TI=706
32444 TUS MS      START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10      60013               36   120
32444 TUS M E     END    53  TASK      6  JOB      2 TI=706
32445 TUS M E     END    58  TASK      7  JOB      2 TI=707
32445 TUS     T   I INTERRUPT  TASK      6  JOB      2 TI=706
32445 TUS     T X   EXECUTING  TASK      7  JOB      2 TI=707
32445 TUS MS      START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10      60009               12   120
32445 TUS M E     END     6  TASK      6  JOB      2 TI=706
32445 TUS MS      START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                  PATH  70003       1      70001              256   120
32445 TUS MS      START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                  PATH  70001       2      70003              256   120
32445 TUS MS      START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10      60009                2   120
32445 TUS M E     END    10  TASK      6  JOB      2 TI=706
32445 TUS MS      START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10      60009                2   120
32445 TUS M E     END    20  TASK      6  JOB      2 TI=706
32445 TUS MS      START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10      60013                6   120
32445 TUS M E     END    22  TASK      6  JOB      2 TI=706
32445 TUS MS      START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60009      10      70001               56   120
32445 TUS M E     END     7  TASK      6  JOB      2 TI=706
32445 TUS MS      START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60009      10      70001               28   120
32445 TUS M E     END    11  TASK      6  JOB      2 TI=706
32445 TUS MS      START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60009      10      70001               14   120
32445 TUS M E     END    21  TASK      6  JOB      2 TI=706
32445 TUS MS      START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60013      10      70001               18   120
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32445 TUS M E       END    23  TASK      6  JOB      2 TI=706
32447 TUS M E       END    28  TASK      7  JOB      2 TI=707
32447 TUS M E       END    29  TASK      7  JOB      2 TI=707
32447 TUS MS        START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70002       1       70001              256   120
32447 TUS MS        START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001       2       70002              256   120
32449 TUS M E       END    28  TASK      7  JOB      2 TI=707
32449 TUS M E       END    29  TASK      7  JOB      2 TI=707
32449 TUS    T  E   END        TASK      7  JOB      2 TI=707
32449 TUS    T X    EXECUTING  TASK      6  JOB      2 TI=706
32449 TUS    T  E   END        TASK      6  JOB      2 TI=706
32449 TUS    T X    EXECUTING  TASK      9  JOB      2 TI=709
32452 TUS    T  E   END        TASK      9  JOB      2 TI=709
32452 TUS    T X    EXECUTING  TASK     14  JOB      2 TI=714
32452 TUS    T X    EXECUTING  TASK     11  JOB      2 TI=711
32452 TUS    T  E   END        TASK     14  JOB      2 TI=714
32452 TUS MS        START  32  TASK     11  JOB      2 TI=711 LENGTH  RATE
                    PATH  70001      24       60095              256   120
32454 TUS M E       END    32  TASK     11  JOB      2 TI=711
32454 TUS MS        START  33  TASK     11  JOB      2 TI=711 LENGTH  RATE
                    PATH  60095      24       70001              256   120
32454 TUS    T   W  MSG WAIT   TASK     11  JOB      2 TI=711
32454 TUS    T X    EXECUTING  TASK     34  JOB      2 TI=723
32456 TUS M E       END    33  TASK     11  JOB      2 TI=711
32456 TUS    T    I INTERRUPT  TASK     34  JOB      2 TI=723
32456 TUS    T X    EXECUTING  TASK     11  JOB      2 TI=711
32456 TUS    T  E   END        TASK     11  JOB      2 TI=711
32456 TUS    T X    EXECUTING  TASK     34  JOB      2 TI=723
32456 TUS    T  E   END        TASK     34  JOB      2 TI=723
32456 TUS    T X    EXECUTING  TASK     35  JOB      2 TI=724
32456 TUS    T  E   END        TASK     35  JOB      2 TI=724
32481 TUS    T X    EXECUTING  TASK      7  JOB      2 TI=707
32481 TUS MS        START  58  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001      24       60095              512   120
32481 TUS MS        START  28  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70004       1       70001              256   120
32481 TUS MS        START  29  TASK      7  JOB      2 TI=707 LENGTH  RATE
                    PATH  70001       2       70004              256   120
32483 TUS M E       END    28  TASK      7  JOB      2 TI=707
32483 TUS M E       END    29  TASK      7  JOB      2 TI=707
32483 TUS    T   W  MSG WAIT   TASK      7  JOB      2 TI=707
32483 TUS    T X    EXECUTING  TASK      6  JOB      2 TI=706
32483 TUS MS        START  51  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012               48   120
32483 TUS M E       END    51  TASK      6  JOB      2 TI=706
32483 TUS MS        START  54  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60018               72   120
32483 TUS M E       END    54  TASK      6  JOB      2 TI=706
32483 TUS MS        START  50  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011               52   120
32483 TUS M E       END    50  TASK      6  JOB      2 TI=706
32483 TUS MS        START  52  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      12       60011                4   120
32483 TUS M E       END    52  TASK      6  JOB      2 TI=706
32483 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60016               36   120
32483 TUS M E       END    53  TASK      6  JOB      2 TI=706
32483 TUS MS        START   8  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      13       60012                2   120
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32483 TUS M E     END    8  TASK      6  JOB      2 TI=706
32483 TUS MS      START 12  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      10      60009              12   120
32483 TUS M E     END   12  TASK      6  JOB      2 TI=706
32483 TUS MS      START 14  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11      60010              10   120
32483 TUS M E     END   14  TASK      6  JOB      2 TI=706
32483 TUS MS      START 16  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      12      60011              10   120
32483 TUS M E     END   16  TASK      6  JOB      2 TI=706
32483 TUS MS      START 18  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      13      60012               2   120
32483 TUS M E     END   18  TASK      6  JOB      2 TI=706
32483 TUS MS      START 24  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      13      60016               6   120
32483 TUS M E     END   24  TASK      6  JOB      2 TI=706
32483 TUS MS      START 26  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      11      60014               2   120
32483 TUS M E     END   26  TASK      6  JOB      2 TI=706
32483 TUS MS      START  6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      12      60011              12   120
32483 TUS M E     END    6  TASK      6  JOB      2 TI=706
32483 TUS MS      START 10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      12      60011               2   120
32483 TUS M E     END   10  TASK      6  JOB      2 TI=706
32483 TUS MS      START 20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      12      60011               2   120
32483 TUS M E     END   20  TASK      6  JOB      2 TI=706
32483 TUS MS      START 22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  70001      12      60015               6   120
32483 TUS M E     END   22  TASK      6  JOB      2 TI=706
32483 TUS MS      START  9  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60012      13      70001              24   120
32483 TUS M E     END    9  TASK      6  JOB      2 TI=706
32483 TUS MS      START 13  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60009      10      70001              32   120
32483 TUS M E     END   13  TASK      6  JOB      2 TI=706
32483 TUS MS      START 15  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60010      11      70001              34   120
32483 TUS M E     END   15  TASK      6  JOB      2 TI=706
32483 TUS MS      START 17  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001              30   120
32483 TUS M E     END   17  TASK      6  JOB      2 TI=706
32483 TUS MS      START 19  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60012      13      70001              14   120
32483 TUS M E     END   19  TASK      6  JOB      2 TI=706
32483 TUS MS      START 25  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60016      13      70001              26   120
32483 TUS M E     END   25  TASK      6  JOB      2 TI=706
32483 TUS MS      START 27  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60014      11      70001              12   120
32483 TUS M E     END   27  TASK      6  JOB      2 TI=706
32483 TUS MS      START  7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001              56   120
32483 TUS M E     END    7  TASK      6  JOB      2 TI=706
32483 TUS MS      START 11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001              28   120
32483 TUS M E     END   11  TASK      6  JOB      2 TI=706
32483 TUS MS      START 21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                  PATH  60011      12      70001              14   120
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32483 TUS M E      END    21  TASK      6 JOB      2 TI=706
32483 TUS MS       START  23  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  60015      12      70001              18   120
32483 TUS M E      END    23  TASK      6 JOB      2 TI=706
32485 TUS M E      END    58  TASK      7 JOB      2 TI=707
32485 TUS    T   I INTERRUPT  TASK      6 JOB      2 TI=706
32485 TUS    T X   EXECUTING  TASK      7 JOB      2 TI=707
32485 TUS MS       START  28  TASK      7 JOB      2 TI=707 LENGTH  RATE
                   PATH  70003       1      70001             256   120
32485 TUS MS       START  29  TASK      7 JOB      2 TI=707 LENGTH  RATE
                   PATH  70001       2      70003             256   120
32487 TUS M E      END    28  TASK      7 JOB      2 TI=707
32487 TUS M E      END    29  TASK      7 JOB      2 TI=707
32487 TUS MS       START  28  TASK      7 JOB      2 TI=707 LENGTH  RATE
                   PATH  70002       1      70001             256   120
32487 TUS MS       START  29  TASK      7 JOB      2 TI=707 LENGTH  RATE
                   PATH  70001       2      70002             256   120
32489 TUS M E      END    28  TASK      7 JOB      2 TI=707
32489 TUS M E      END    29  TASK      7 JOB      2 TI=707
32489 TUS    T  E  END        TASK      7 JOB      2 TI=707
32489 TUS    T X   EXECUTING  TASK      6 JOB      2 TI=706
32490 TUS MS       START  54  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60017              72   120
32490 TUS M E      END    54  TASK      6 JOB      2 TI=706
32490 TUS MS       START  50  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60010              52   120
32490 TUS M E      END    50  TASK      6 JOB      2 TI=706
32490 TUS MS       START  52  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60010               4   120
32490 TUS M E      END    5?  TASK      6 JOB      2 TI=706
32490 TUS MS       START  53  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      12      60015              36   120
32490 TUS M E      END    53  TASK      6 JOB      2 TI=706
32490 TUS MS       START  26  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60013               2   120
32490 TUS M E      END    26  TASK      6 JOB      2 TI=706
32490 TUS MS       START   6  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60010              12   120
32490 TUS M E      END     6  TASK      6 JOB      2 TI=706
32490 TUS MS       START  10  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60010               2   120
32490 TUS M E      END    10  TASK      6 JOB      2 TI=706
32490 TUS MS       START  20  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60010               2   120
32490 TUS M E      END    20  TASK      6 JOB      2 TI=706
32490 TUS MS       START  22  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60014               6   120
32490 TUS M E      END    22  TASK      6 JOB      2 TI=706
32490 TUS MS       START  50  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009              52   120
32490 TUS M E      END    50  TASK      6 JOB      2 TI=706
32490 TUS MS       START  52  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      10      60009               4   120
32490 TUS M E      END    52  TASK      6 JOB      2 TI=706
32490 TUS MS       START  53  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  70001      11      60014              36   120
32490 TUS M E      END    53  TASK      6 JOB      2 TI=706
32490 TUS MS       START  27  TASK      6 JOB      2 TI=706 LENGTH  RATE
                   PATH  60013      10      70001              12   120
32490 TUS M E      END    27  TASK      6 JOB      2 TI=706
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32490 TUS MS        START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60010      11       70001              56   120
32490 TUS M E       END     7  TASK      6  JOB      2 TI=706
32490 TUS MS        START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60010      11       70001              28   120
32490 TUS M E       END    11  TASK      6  JOB      2 TI=706
32490 TUS MS        START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60010      11       70001              14   120
32490 TUS M E       END    21  TASK      6  JOB      2 TI=706
32490 TUS MS        START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60014      11       70001              18   120
32490 TUS M E       END    23  TASK      6  JOB      2 TI=706
32490 TUS MS        START  53  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60013              36   120
32490 TUS M E       END    53  TASK      6  JOB      2 TI=706
32491 TUS MS        START   6  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009              12   120
32491 TUS M E       END     6  TASK      6  JOB      2 TI=706
32491 TUS MS        START  10  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009               2   120
32491 TUS M E       END    10  TASK      6  JOB      2 TI=706
32491 TUS MS        START  20  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60009               2   120
32491 TUS M E       END    20  TASK      6  JOB      2 TI=706
32491 TUS MS        START  22  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  70001      10       60013               6   120
32491 TUS M E       END    22  TASK      6  JOB      2 TI=706
32491 TUS MS        START   7  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001              56   120
32491 TUS M E       END     7  TASK      6  JOB      2 TI=706
32491 TUS MS        START  11  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001              28   120
32491 TUS M E       END    11  TASK      6  JOB      2 TI=706
32491 TUS MS        START  21  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60009      10       70001              14   120
32491 TUS M E       END    21  TASK      6  JOB      2 TI=706
32491 TUS MS        START  23  TASK      6  JOB      2 TI=706 LENGTH  RATE
                    PATH  60013      10       70001              18   120
32491 TUS M E       END    23  TASK      6  JOB      2 TI=706
32491 TUS     T  E  END        TASK      6  JOB      2 TI=706
32491 TUS     T X   EXECUTING  TASK      9  JOB      2 TI=709
32494 TUS     T  E  END        TASK      9  JOB      2 TI=709
32494 TUS     T X   EXECUTING  TASK     10  JOB      2 TI=710
32501 TUS     T    I INTERRUPT TASK     10  JOB      2 TI=710
32501 TUS     T X   EXECUTING  TASK     11  JOB      2 TI=711
```

APPENDIX D

SUMMARY OUTPUT REPORTS

This appendix provides the statistical and control reports as specified in paragraph 5.2.6.1.

Statistical summaries for four different runs are given, viz.,

1. for a 500 ms concentrated simulation run with specification NASA.SPECS10.DATA and jobschedule JSCA06. These printouts appear on pages D-2 through D-5.

2. for a 1.24-second flight-segmented simulation run with specification NASA.SPECS10.DATA and jobschedule JSCA07. These printouts appear on pages D-6 through D-9.

3. for a 1.10-second concentrated simulation run with specification NASA.SPECS10.DATA and jobschedule JSCA06. These printouts appear on pages D-10 through D-13.

4. for a 50 ms concentrated simulation run with specification NASA.SPECS20.DATA with four Virtual Machines and jobschedule JSCA08. These printouts appear on pages D-14 through D-17.

```
DURING    0.50 SECONDS OF SIMULATED SHUTTLE OPERATIONS
A TOTAL OF     20 DIFFERENT FUNCTIONS WERE INTRODUCED.
THESE FUNCTIONS WERE ACTIVATED     99 TIMES, STATUS IS:
          95 WERE COMPLETED
          16 ARE WAITING FOR NEXT ACTIVATION
           3 ARE IN READY STATE, I.E. WAITING FOR CPU
           0 ARE WAITING FOR MESSAGES TO COMPLETE
           1 PRESENTLY EXECUTING, I.E. IN ACTIVE STATE
FUNCTIONS WERE INTERRUPTED     33 TIMES.
    0 FUNCTION ACTIVATIONS WERE ABORTED AS FUNCTION STILL ACTIVE.

A TOTAL OF    822 MESSAGES WERE SUCCESSFULLY TRANSMITTED.
        0 WERE IN BURST MODE OVER MULTIPLEXED DATA LINKS
        0 TRANSMISSIONS WERE FOR LOADING OF MEMORIES
        0 TRANSMISSIONS WERE INTERRUPTED BECAUSE OF BURST MODE
          OPERATIONS OR KILLING OF TASKS
        0 SOURCE-DRIVEN MESSAGES WERE LOST DUE TO BACKLOGGING.

DEVICE    1, CLASS       1, WAS INVOLVED IN       5 TRANSMISSIONS,
     AVERAGING       8   MS.  UTILIZATION WAS   7   PERCENT.
DEVICE    2, CLASS       1, WAS INVOLVED IN       5 TRANSMISSIONS,
     AVERAGING       8   MS.  UTILIZATION WAS   7   PERCENT.
DEVICE    3, CLASS       1, WAS INVOLVED IN       5 TRANSMISSIONS,
     AVERAGING       8   MS.  UTILIZATION WAS   7   PERCENT.
DEVICE    9, CLASS       1, WAS INVOLVED IN     130 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   10, CLASS       1, WAS INVOLVED IN     130 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   11, CLASS       1, WAS INVOLVED IN     130 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   12, CLASS       1, WAS INVOLVED IN      65 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   13, CLASS       1, WAS INVOLVED IN      65 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   14, CLASS       1, WAS INVOLVED IN      65 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   15, CLASS       1, WAS INVOLVED IN      39 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   16, CLASS       1, WAS INVOLVED IN      39 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   17, CLASS       1, WAS INVOLVED IN      13 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   18, CLASS       1, WAS INVOLVED IN      13 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   27, CLASS       1, WAS INVOLVED IN       7 TRANSMISSIONS,
     AVERAGING      11   MS.  UTILIZATION WAS  15   PERCENT.
DEVICE   95, CLASS       1, WAS INVOLVED IN      33 TRANSMISSIONS,
     AVERAGING    2.79MS.  UTILIZATION WAS  18   PERCENT.

MEMORY    1, SIZE     125 PAGES, HELD AN AVERAGE OF       3   PAGES,
     WITH A MAXIMUM OF       3 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1399   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      720
     CH/MS, AND THE AVERAGE RATE WAS        1.36CH/MS.
MEMORY    2, SIZE     125 PAGES, HELD AN AVERAGE OF       0   PAGES,
     WITH A MAXIMUM OF       0 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1399   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
     CH/MS, AND THE AVERAGE RATE WAS        0.19CH/MS.
MEMORY    3, SIZE     125 PAGES, HELD AN AVERAGE OF       0   PAGES,
     WITH A MAXIMUM OF       0 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1399   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
```

CH/MS, AND THE AVERAGE RATE WAS 0.19CH/MS.
MEMORY 4, SIZE 125 PAGES, HELD AN AVERAGE OF 0 PAGES,
WITH A MAXIMUM OF 0 PAGES. THE POTENTIAL TRANSMISSION RATE
IS 1399 CH/MS. THE MAXIMUM ACHIEVED RATE WAS 240
CH/MS, AND THE AVERAGE RATE WAS 0.19CH/MS.

PROCESSOR 1, V.M. 1, WAS USED 175 TIMES FOR
A TOTAL OF 388 MS. UTILIZATION WAS 77 PERCENT.

DATA LINK 1 WAS INVOLVED IN 39 TRANSMISSIONS, AVERAGING
2 MS. UTILIZATION WAS 15 PERCENT.
POTENTIAL TRANSMISSION RATE IS 120 CH/MS.
DATA LINK 2 WAS INVOLVED IN 39 TRANSMISSIONS, AVERAGING
2 MS. UTILIZATION WAS 15 PERCENT.
POTENTIAL TRANSMISSION RATE IS 120 CH/MS.
DATA LINK 6 WAS INVOLVED IN 5 TRANSMISSIONS, AVERAGING
8 MS. UTILIZATION WAS 7 PERCENT.
POTENTIAL TRANSMISSION RATE IS 120 CH/MS.
DATA LINK 7 WAS INVOLVED IN 5 TRANSMISSIONS, AVERAGING
8 MS. UTILIZATION WAS 7 PERCENT.
POTENTIAL TRANSMISSION RATE IS 120 CH/MS.
DATA LINK 8 WAS INVOLVED IN 5 TRANSMISSIONS, AVERAGING
8 MS. UTILIZATION WAS 7 PERCENT.
POTENTIAL TRANSMISSION RATE IS 120 CH/MS.
DATA LINK 10 WAS INVOLVED IN 221 TRANSMISSIONS, AVERAGING
0 MS. UTILIZATION WAS 0 PERCENT.
POTENTIAL TRANSMISSION RATE IS 120 CH/MS.
DATA LINK 11 WAS INVOLVED IN 195 TRANSMISSIONS, AVERAGING
0 MS. UTILIZATION WAS 0 PERCENT.
POTENTIAL TRANSMISSION RATE IS 120 CH/MS.
DATA LINK 12 WAS INVOLVED IN 169 TRANSMISSIONS, AVERAGANG
0 MS. UTILIZATION WAS 0 PERCENT.
POTENTIAL TRANSMISSION RATE IS 120 CH/MS.
DATA LINK 13 WAS INVOLVED IN 104 TRANSMISSIONS, AVERAGING
0 MS. UTILIZATION WAS 0 PERCENT.
POTENTIAL TRANSMISSION RATE IS 120 CH/MS.
DATA LINK 24 WAS INVOLVED IN 33 TRANSMISSIONS, AVERAGING
2.79MS. UTILIZATION WAS 18 PERCENT.
POTENTIAL TRANSMISSION RATE IS 120 CH/MS.

DATA SET 1, ON STORAGE UNIT 1, AVERAGED 10000 CH, AND REACHED
A MAXIMUM OF 10000 CH.
DATA SET 2, ON STORAGE UNIT 1, AVERAGED 10240 CH, AND REACHED
A MAXIMUM OF 10240 CH.

KEY BLOCKS -

	BACKLOG			AVERAGE DELAY (MS)		TIME
BLOCK	MAXIMUM	AVERAGE	CURRENT	ALL	DELAYED	32.50SEC.
1138	0	0	0	0	0	
1151	20	0	0	4	4	
1182	2	0	0	2.50	2.50	
1184	1	0.01	0	1.73	0	
1185	1	0	0	0	0	
1192	1	0	1	2.43	2.43	
1201	20	0.87	20	0	0	
1204	1	0	0	1	0	
1488	0	0	0	0	0	
1495	0	0	0	0	0	
1601	1	0	0	0	0	
1605	23	0.02	4	2.75	0	
1608	1	0	0	0	0	
1675	2	0	0	0.03	0	
1682	1	0	0	0	0	
1686	1	0	0	0	0	
1693	0	0	0	0	0	
1706	0	0	0	0	0	

KEY BLOCKS - (CONT'D)

BLOCK	BACKLOG MAXIMUM	BACKLOG AVERAGE	BACKLOG CURRENT	AVERAGE DELAY (MS) ALL	AVERAGE DELAY (MS) DELAYED	TIME 32.50SEC.
1707	0	0	0	0	0	
1708	1	0	0	0	0	
1712	1	0	0	0	0	
1734	0	0	0	0	0	
1738	1	0	0	0	0	
1748	1	0	0	0	0	
1751	1	0	0	0	0	
1753	1	0	0	0	0	
1754	6	0.01	0	0.53	0	
1808	0	0	0	0	0	
1846	5	0	0	0.43	0	
1847	0	0	0	0	0	
1851	0	0	0	0	0	
1935	0	0	0	0	0	
1936	0	0	0	0	0	
3004	0	0	0	0	0	
3005	0	0	0	0	0	
3032	19	0.04	3	10.15	11.02	
3089	1	0	0	0	0	
6002	0	0	0	0	0	
8005	0	0	0	0	0	
9052	2	0	0	0.01	0	
11052	0	0	0	0	0	

SUMMARY FOR TIME 32501 , RELATIVE TIME 32501

STORAGE	CAPACITY	CONTENTS CURRENT	CONTENTS MAXIMUM	CONTENTS AVERAGE	NUMBER WITHDRAWN	AVERAGE PERIOD ALL UNITS
1	10000	10000	10000	10000.00	0	16250.49
2	10240	10240	10240	10240.00	0	16250.50
111	125	3	3	3.00	0	16250.00
112	125	0	0	0.00	0	0.00
113	125	0	0	0.00	0	0.00
114	125	0	0	0.00	0	0.00
131	1399	0	720	1.36	97807	0.45
132	1399	0	240	0.19	3120	2.00
133	1399	0	240	0.19	3120	2.00
134	1399	0	240	0.19	3120	2.00
151	17000000	20240	20240	20240.00	0	16250.50
152	17000000	0	0	0.00	0	0.00

SUMMARY FOR TIME 32501 , RELATIVE TIME 32501

FACILITY	PERCENTAGE UTILIZATION	NUMBER OF TIMES USED	AVERAGE PERIOD PER USE	CURRENT PRIORITY	CURRENT RECOURSE	NUMBER SHELVED
1I	1.19	175	2.22	25	2000	
81U	0.12	10	4.00			
82U	0.12	10	4.00			
83U	0.12	10	4.00			
89U	0.00	260	0.00			
90U	0.00	260	0.00			
91U	0.00	260	0.00			
92U	0.00	130	0.00			
93U	0.00	130	0.00			
94U	0.00	130	0.00			
95U	0.00	78	0.00			
96U	0.00	78	0.00			
97U	0.00	26	0.00			
98U	0.00	26	0.00			

SUMMARY FOR TIME 32501 , RELATIVE TIME 32501 (CONT'D)

FACILITY	PERCENTAGE UTILIZATION	NUMBER OF TIMES USED	AVERAGE PERIOD PER USE	CURRENT PRIORITY	CURRENT RECOURSE	NUMBER SHELVED
107U	0.24	14	5.50			
175U	0.28	66	1.39			
181U	0.24	39	2.00			
182U	0.24	39	2.00			
186U	0.12	5	8.00			
187U	0.12	5	8.00			
188U	0.12	5	8.00			
190U	0.00	221	0.00			
191U	0.00	195	0.00			
192U	0.00	169	0.00			
193U	0.00	104	0.00			
204U	0.28	33	2.79			

CURRENT TRANSACTION COUNT	146
MAXIMUM NUMBER OF TRANSACTIONS	223
NUMBER OF TRY OPERATIONS	132809
NUMBER OF TRANSACTION MOVES	394561
NUMBER OF VARIABLE EVALUATIONS	612316
MAXIMUM VARIABLE RECURSION	5
NUMBER OF ADMIT ATTEMPTS	907770
NUMBER OF FUNCTION POINTS	1144
MOST RECENT BLOCK ID	3032
NUMBER OF BLOCK SPACES USED	1917
NUMBER OF REPORT LINES	91
NUMBER OF VARIABLE ELEMENTS	1126
CURRENT UTILIZATION OF STACKS	846

```
DURING    1.24 SECONDS OF SIMULATED SHUTTLE OPERATIONS
A TOTAL OF     20 DIFFERENT FUNCTIONS WERE INTRODUCED.
THESE FUNCTIONS WERE ACTIVATED    196 TIMES, STATUS IS:
        193 WERE COMPLETED
         17 ARE WAITING FOR NEXT ACTIVATION
          1 ARE IN READY STATE, I.E. WAITING FOR CPU
          1 ARE WAITING FOR MESSAGES TO COMPLETE
          1 PRESENTLY EXECUTING, I.E. IN ACTIVE STATE
FUNCTIONS WERE INTERRUPTED     63 TIMES.
    0 FUNCTION ACTIVATIONS WERE ABORTED AS FUNCTION STILL ACTIVE.


A TOTAL OF   2001 MESSAGES WERE SUCCESSFULLY TRANSMITTED.
       0 WERE IN BURST MODE OVER MULTIPLEXED DATA LINKS
       0 TRANSMISSIONS WERE FOR LOADING OF MEMORIES
       0 TRANSMISSIONS WERE INTERRUPTED BECAUSE OF BURST MODE
         OPERATIONS OR KILLING OF TASKS
       0 SOURCE-DRIVEN MESSAGES WERE LOST DUE TO BACKLOGGING.


DEVICE    1, CLASS       1, WAS INVOLVED IN      13 TRANSMISSIONS,
     AVERAGING       8  MS.  UTILIZATION WAS   8  PERCENT.
DEVICE    2, CLASS       1, WAS INVOLVED IN      13 TRANSMISSIONS,
     AVERAGING       8  MS.  UTILIZATION WAS   8  PERCENT.
DEVICE    3, CLASS       1, WAS INVOLVED IN      13 TRANSMISSIONS,
     AVERAGING       8  MS.  UTILIZATION WAS   8  PERCENT.
DEVICE    9, CLASS       1, WAS INVOLVED IN     314 TRANSMISSIONS,
     AVERAGING       0  MS.  UTILIZATION WAS   0  PERCENT.
DEVICE   10, CLASS       1, WAS INVOLVED IN     319 TRANSMISSIONS,
     AVERAGING       0  MS.  UTILIZATION WAS   0  PERCENT.
DEVICE   11, CLASS       1, WAS INVOLVED IN     320 TRANSMISSIONS,
     AVERAGING       0  MS.  UTILIZATION WAS   0  PERCENT.
DEVICE   12, CLASS       1, WAS INVOLVED IN     160 TRANSMISSIONS,
     AVERAGING       0  MS.  UTILIZATION WAS   0  PERCENT.
DEVICE   13, CLASS       1, WAS INVOLVED IN     157 TRANSMISSIONS,
     AVERAGING       0  MS.  UTILIZATION WAS   0  PERCENT.
DEVICE   14, CLASS       1, WAS INVOLVED IN     159 TRANSMISSIONS,
     AVERAGING       0  MS.  UTILIZATION WAS   0  PERCENT.
DEVICE   15, CLASS       1, WAS INVOLVED IN      96 TRANSMISSIONS,
     AVERAGING       0  MS.  UTILIZATION WAS   0  PERCENT.
DEVICE   16, CLASS       1, WAS INVOLVED IN      96 TRANSMISSIONS,
     AVERAGING       0  MS.  UTILIZATION WAS   0  PERCENT.
DEVICE   17, CLASS       1, WAS INVOLVED IN      32 TRANSMISSIONS,
     AVERAGING       0  MS.  UTILIZATION WAS   0  PERCENT.
DEVICE   18, CLASS       1, WAS INVOLVED IN      32 TRANSMISSIONS,
     AVERAGING       0  MS.  UTILIZATION WAS   0  PERCENT.
DEVICE   27, CLASS       1, WAS INVOLVED IN       8 TRANSMISSIONS,
     AVERAGING      11  MS.  UTILIZATION WAS   7  PERCENT.
DEVICE   95, CLASS       1  WAS INVOLVED IN      82 TRANSMISSIONS,
     AVERAGING     2.79MS.  UTILIZATION WAS  18  PERCENT.

MEMORY    1, SIZE     125 PAGES, HELD AN AVERAGE OF       3  PAGES,
     WITH A MAXIMUM OF       3 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1400  CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      720
     CH/MS, AND THE AVERAGE RATE WAS        3.31CH/MS.
MEMORY    2, SIZE     125 PAGES, HELD AN AVERAGE OF       0  PAGES,
     WITH A MAXIMUM OF       0 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1400  CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
     CH/MS, AND THE AVERAGE RATE WAS        0.45CH/MS.
```

```
MEMORY    3, SIZE     125 PAGES, HELD AN AVERAGE OF       0   PAGES,
     WITH A MAXIMUM OF       0 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1400   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
     CH/MS, AND THE AVERAGE RATE WAS        0.45CH/MS.
MEMORY    4, SIZE     125 PAGES, HELD AN AVERAGE OF       0   PAGES,
     WITH A MAXIMUM OF       0 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1400   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
     CH/MS, AND THE AVERAGE RATE WAS        0.46CH/MS.

PROCESSOR   1, V.M.    1, WAS USED     337 TIMES FOR
     A TOTAL OF    879   MS.  UTILIZATION WAS  70 PERCENT.

DATA LINK     1 WAS INVOLVED IN      94 TRANSMISSIONS, AVERAGING
          2   MS.  UTILIZATION WAS  15 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     2 WAS INVOLVED IN      94 TRANSMISSIONS, AVERAGING
          2   MS.  UTILIZATION WAS  15 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     6 WAS INVOLVED IN      13 TRANSMISSIONS, AVERAGING
          8   MS.  UTILIZATION WAS   8 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     7 WAS INVOLVED IN      13 TRANSMISSIONS, AVERAGING
          8   MS.  UTILIZATION WAS   8 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     8 WAS INVOLVED IN      13 TRANSMISSIONS, AVERAGING
          8   MS.  UTILIZATION WAS   8 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    10 WAS INVOLVED IN     535 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    11 WAS INVOLVED IN     478 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    12 WAS INVOLVED IN     416 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    13 WAS INVOLVED IN     256 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    24 WAS INVOLVED IN      82 TRANSMISSIONS, AVERAGING
          2.77MS.  UTILIZATION WAS  18 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.

DATA SET   1, ON STORAGE UNIT    1, AVERAGED    10000   CH, AND REACHED
     A MAXIMUM OF   10000 CH.
DATA SET   2, ON STORAGE UNIT    1, AVERAGED    10240   CH, AND REACHED
     A MAXIMUM OF   10240 CH.
```

KEY BLOCKS -

	BACKLOG			AVERAGE DELAY (MS)		TIME
BLOCK	MAXIMUM	AVERAGE	CURRENT	ALL	DELAYED	33.24SEC.
1138	0	0	0	0	0	
1151	20	0	0	4	4	
1182	2	0	0	2.19	2.19	
1184	1	0.02	0	1.91	0	
1185	1	0	0	0	0	
1192	1	0 01	1	2.50	2.50	
1201	20	1.29	20	0	0	
1204	1	0	0	1	0	
1488	0	0	0	0	0	
1495	0	0	0	0	0	
1601	1	0	0	0	0	
1605	23	0.06	0	2.68	0	
1608	1	0	0	0	0	
1675	2	0	0	0.01	0	
1682	1	0	0	0	0	
1686	1	0	0	0	0	
1693	0	0	0	0	0	
1706	0	0	0	0	0	
1707	0	0	0	0	0	
1708	1	0	0	0	0	
1712	1	0	0	0	0	
1734	0	0	0	0	0	
1738	1	0	0	0	0	
1748	1	0	0	0	0	
1751	1	0	0	0	0	
1753	1	0	0	0	0	
1754	6	0.03	1	0.50	0	
1808	0	0	0	0	0	
1846	5	0.01	4	0.43	0	
1847	0	0	0	0	0	
1851	0	0	0	0	0	
1935	0	0	0	0	0	
1936	0	0	0	0	0	
3004	0	0	0	0	0	
3005	0	0	0	0	0	
3032	19	0.06	1	9.15	10.05	
3089	1	0	0	0	0	
6002	0	0	0	0	0	
8005	0	0	0	0	0	
9052	2	0	0	0	0	
11052	0	0	0	0	0	

SUMMARY FOR TIME 33244 , RELATIVE TIME 33244

STORAGE	CAPACITY	CONTENTS CURRENT	CONTENTS MAXIMUM	CONTENTS AVERAGE	NUMBER WITHDRAWN	AVERAGE PERIOD ALL UNITS
1	10000	10000	10000	10000.00	0	16622.00
2	10240	10240	10240	10240.00	0	16622.00
111	125	3	3	3.00	0	16621.50
112	125	0	0	0.00	0	0.00
113	125	0	0	0.00	0	0.00
114	125	0	0	0.00	0	0.00
131	1400	120	720	3.31	239168	0.46
132	1400	0	240	0.45	7440	2.00
133	1400	0	240	0.45	7440	2.00
134	1400	0	240	0.46	7680	2.00
151	17000000	20240	20240	20240.00	0	16622.00
152	17000000	0	0	0.00	0	0.00

FACILITY	PERCENTAGE UTILIZATION	NUMBER OF TIMES USED	AVERAGE PERIOD PER USE	CURRENT PRIORITY	CURRENT RECOURSE	NUMBER SHELVED
II	2.64	337	2.61	28	2000	
81U	0.31	26	4.00			
82U	0.31	26	4.00			
83U	0.31	26	4.00			
89U	0.00	628	0.00			
90U	0.00	638	0.00			
91U	0.00	640	0.00			
92U	0.00	320	0.00			
93U	0.00	314	0.00			
94U	0.00	318	0.00			
95U	0.00	192	0.00			
96U	0.00	192	0.00			
97U	0.00	64	0.00			
98U	0.00	64	0.00			
107U	0.26	16	5.50			
175U	0.68	163	1.39	52		
181U	0.57	94	2.00			
182U	0.57	94	2.00			
186U	0.31	13	8.00			
187U	0.31	13	8.00			
188U	0.31	13	8.00			
190U	0.00	535	0.00			
191U	0.00	478	0.00			
192U	0.00	416	0.00			
193U	0.00	256	0.00			
204U	0.68	82	2.77	52	9002	

CURRENT TRANSACTION COUNT	148
MAXIMUM NUMBER OF TRANSACTIONS	223
NUMBER OF TRY OPERATIONS	255171
NUMBER OF TRANSACTION MOVES	797804
NUMBER OF VARIABLE EVALUATIONS	1163262
MAXIMUM VARIABLE RECURSION	5
NUMBER OF ADMIT ATTEMPTS	1668396
NUMBER OF FUNCTION POINTS	1144
MOST RECENT BLOCK ID	8021
NUMBER OF BLOCK SPACES USED	1917
NUMBER OF REPORT LINES	92
NUMBER OF VARIABLE ELEMENTS	1126
CURRENT UTILIZATION OF STACKS	1290

```
DURING    1.10 SECONDS OF SIMULATED SHUTTLE OPERATIONS
A TOTAL OF     20 DIFFERENT FUNCTIONS WERE INTRODUCED.
THESE FUNCTIONS WERE ACTIVATED    184 TIMES, STATUS IS:
         182 WERE COMPLETED
          18 ARE WAITING FOR NEXT ACTIVATION
           1 ARE IN READY STATE, I.E. WAITING FOR CPU
           0 ARE WAITING FOR MESSAGES TO COMPLETE
           1 PRESENTLY EXECUTING, I.E. IN ACTIVE STATE
FUNCTIONS WERE INTERRUPTED     60 TIMES.
    1 FUNCTION ACTIVATIONS WERE ABORTED AS FUNCTION STILL ACTIVE.


A TOTAL OF   1448 MESSAGES WERE SUCCESSFULLY TRANSMITTED.
        0 WERE IN BURST MODE OVER MULTIPLEXED DATA LINKS
        0 TRANSMISSIONS WERE FOR LOADING OF MEMORIES
        0 TRANSMISSIONS WERE INTERRUPTED BECAUSE OF BURST MODE
          OPERATIONS OR KILLING OF TASKS
        0 SOURCE-DRIVEN MESSAGES WERE LOST DUE TO BACKLOGGING.


DEVICE    1, CLASS       1, WAS INVOLVED IN      11 TRANSMISSIONS,
     AVERAGING       8   MS.  UTILIZATION WAS   7   PERCENT.
DEVICE    2, CLASS       1, WAS INVOLVED IN      11 TRANSMISSIONS,
     AVERAGING       8   MS.  UTILIZATION WAS   7   PERCENT.
DEVICE    3, CLASS       1, WAS INVOLVED IN      11 TRANSMISSIONS,
     AVERAGING       8   MS.  UTILIZATION WAS   7   PERCENT.
DEVICE    9, CLASS       1, WAS INVOLVED IN     220 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   10, CLASS       1, WAS INVOLVED IN     220 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   11, CLASS       1, WAS INVOLVED IN     220 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   12, CLASS       1, WAS INVOLVED IN     110 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   13, CLASS       1, WAS INVOLVED IN     110 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   14, CLASS       1, WAS INVOLVED IN     110 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   15, CLASS       1, WAS INVOLVED IN      66 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   16, CLASS       1, WAS INVOLVED IN      66 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   17, CLASS       1, WAS INVOLVED IN      22 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   18, CLASS       1, WAS INVOLVED IN      22 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   27, CLASS       1, WAS INVOLVED IN       9 TRANSMISSIONS,
     AVERAGING      11   MS.  UTILIZATION WAS   8   PERCENT.
DEVICE   95, CLASS       1, WAS INVOLVED IN      72 TRANSMISSIONS,
     AVERAGING    2.78MS.  UTILIZATION WAS  18   PERCENT.

MEMORY    1, SIZE     125 PAGES, HELD AN AVERAGE OF       3   PAGES,
     WITH A MAXIMUM OF       3 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1400   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      720
     CH/MS, AND THE AVERAGE RATE WAS        1.31CH/MS.
MEMORY    2, SIZE     125 PAGES, HELD AN AVERAGE OF       0   PAGES,
     WITH A MAXIMUM OF       0 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1400   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
     CH/MS, AND THE AVERAGE RATE WAS        0.18CH/MS.
```

```
MEMORY    3, SIZE     125 PAGES, HELD AN AVERAGE OF       0   PAGES,
     WITH A MAXIMUM OF       0 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1400   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
     CH/MS, AND THE AVERAGE RATE WAS        0.18CH/MS.
MEMORY    4, SIZE     125 PAGES, HELD AN AVERAGE OF       0   PAGES,
     WITH A MAXIMUM OF       0 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1400   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
     CH/MS, AND THE AVERAGE RATE WAS        0.18CH/MS.

PROCESSOR   1, V.M.    1, WAS USED     318 TIMES FOR
     A TOTAL OF    741   MS.  UTILIZATION WAS  67 PERCENT.

DATA LINK     1 WAS INVOLVED IN      84 TRANSMISSIONS, AVERAGING
          2   MS.  UTILIZATION WAS  15 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     2 WAS INVOLVED IN      84 TRANSMISSIONS, AVERAGING
          2   MS.  UTILIZATION WAS  15 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     6 WAS INVOLVED IN      11 TRANSMISSIONS, AVERAGING
          8   MS.  UTILIZATION WAS   7 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     7 WAS INVOLVED IN      11 TRANSMISSIONS, AVERAGING
          8   MS.  UTILIZATION WAS   7 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     8 WAS INVOLVED IN      11 TRANSMISSIONS, AVERAGING
          8   MS.  UTILIZATION WAS   7 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    10 WAS INVOLVED IN     374 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    11 WAS INVOLVED IN     330 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    12 WAS INVOLVED IN     286 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    13 WAS INVOLVED IN     176 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    24 WAS INVOLVED IN      72 TRANSMISSIONS, AVERAGING
          2.78MS.  UTILIZATION WAS  18 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.

DATA SET   1, ON STORAGE UNIT    1, AVERAGED    10000   CH, AND REACHED
     A MAXIMUM OF   10000 CH.
DATA SET   2, ON STORAGE UNIT    1, AVERAGED    10240   CH, AND REACHED
     A MAXIMUM OF   10240 CH.
```

KEY BLOCKS -

	BACKLOG			AVERAGE DELAY (MS)		TIME
BLOCK	MAXIMUM	AVERAGE	CURRENT	ALL	DELAYED	73.10SEC.
1138	0	0	0	0	0	
1151	20	0	0	4	4	
1182	2	0	0	2.33	2.33	
1184	1	0.01	0	1.67	0	
1185	1	0	0	0	0	
1192	1	0	1	2.77	2.77	
1201	20	0.55	20	0	0	
1204	1	0	0	1	0	
1488	0	0	0	0	0	
1495	0	0	0	0	0	
1601	1	0	0	0	0	
1605	23	0.02	4	2.69	0	
1608	1	0	0	0	0	
1675	2	0	0	0.02	0	
1682	1	0	0	0	0	
1686	1	0	0	0	0	
1693	0	0	0	0	0	
1706	0	0	0	0	0	
1707	0	0	0	0	0	
1708	1	0	0	0	0	
1712	1	0	0	0	0	
1734	0	0	0	0	0	
1738	1	0	0	0	0	
1748	1	0	0	0	0	
1751	1	0	0	0	0	
1753	1	0	0	0	0	
1754	6	0.01	0	0.61	0	
1808	0	0	0	0	0	
1846	5	0	0	0.41	0	
1847	0	0	0	0	0	
1851	0	0	0	0	0	
1935	0	0	0	0	0	
1936	0	0	0	0	0	
3004	0	0	0	0	0	
3005	0	0	0	0	0	
3032	19	0.02	1	8.65	9.56	
3089	1	0	0	0	0	
6002	0	0	0	0	0	
8005	0	0	0	0	0	
9052	2	0	0	0.01	0	
11052	0	0	0	0	0	

SUMMARY FOR TIME 73101 , RELATIVE TIME 73101

STORAGE	CAPACITY	CONTENTS CURRENT	CONTENTS MAXIMUM	CONTENTS AVERAGE	NUMBER WITHDRAWN	AVERAGE PERIOD ALL UNITS
1	10000	10000	10000	10000.00	0	36550.50
2	10240	10240	10240	10240.00	0	36550.50
111	125	3	3	3.00	0	36550.00
112	125	0	0	0.00	0	0.00
113	125	0	0	0.00	0	0.00
114	125	0	0	0.00	0	0.00
131	1400	0	720	1.31	172689	0.56
132	1400	0	240	0.18	6720	2.00
133	1400	0	240	0.18	6720	2.00
134	1400	0	240	0.18	6720	2.00
151	17000000	20240	20240	20240.00	0	36550.50
152	17000000	0	0	0.00	0	0.00

FACILITY	PERCENTAGE UTILIZATION	NUMBER OF TIMES USED	AVERAGE PERIOD PER USE	CURRENT PRIORITY	CURRENT RECOURSE	NUMBER SHELVED
1I	1.01	318	2.33	25	2000	
81U	0.12	22	4.00			
82U	0.12	22	4.00			
83U	0.12	22	4.00			
89U	0.00	440	0.00			
90U	0.00	440	0.00			
91U	0.00	440	0.00			
92U	0.00	220	0.00			
93U	0.00	220	0.00			
94U	0.00	220	0.00			
95U	0.00	132	0.00			
96U	0.00	132	0.00			
97U	0.00	44	0.00			
98U	0.00	44	0.00			
107U	0.14	18	5.50			
175U	0.27	144	1.39			
181U	0.23	84	2.00			
182U	0.23	84	2.00			
186U	0.12	11	8.00			
187U	0.12	11	8.00			
188U	0.12	11	8.00			
190U	0.00	374	0.00			
191U	0.00	330	0.00			
192U	0.00	286	0.00			
193U	0.00	176	0.00			
204U	0.27	72	2.78			

CURRENT TRANSACTION COUNT	146
MAXIMUM NUMBER OF TRANSACTIONS	223
NUMBER OF TRY OPERATIONS	197939
NUMBER OF TRANSACTION MOVES	615598
NUMBER OF VARIABLE EVALUATIONS	893254
MAXIMUM VARIABLE RECURSION	5
NUMBER OF ADMIT ATTEMPTS	1273129
NUMBER OF FUNCTION POINTS	1144
MOST RECENT BLOCK ID	3032
NUMBER OF BLOCK SPACES USED	1917
NUMBER OF REPORT LINES	92
NUMBER OF VARIABLE ELEMENTS	1126
CURRENT UTILIZATION OF STACKS	1242

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DURING     0.05 SECONDS OF SIMULATED SHUTTLE OPERATIONS
A TOTAL OF      80 DIFFERENT FUNCTIONS WERE INTRODUCED.
THESE FUNCTIONS WERE ACTIVATED      68 TIMES, STATUS IS:
          52 WERE COMPLETED
          64 ARE WAITING FOR NEXT ACTIVATION
          12 ARE IN READY STATE, I.E. WAITING FOR CPU
           0 ARE WAITING FOR MESSAGES TO COMPLETE
           4 PRESENTLY EXECUTING, I.E. IN ACTIVE STATE
FUNCTIONS WERE INTERRUPTED      11 TIMES.
   13 FUNCTION ACTIVATIONS WERE ABORTED AS FUNCTION STILL ACTIVE.


A TOTAL OF     121 MESSAGES WERE SUCCESSFULLY TRANSMITTED.
        0 WERE IN BURST MODE OVER MULTIPLEXED DATA LINKS
        0 TRANSMISSIONS WERE FOR LOADING OF MEMORIES
        0 TRANSMISSIONS WERE INTERRUPTED BECAUSE OF BURST MODE
          OPERATIONS OR KILLING OF TASKS
        0 SOURCE-DRIVEN MESSAGES WERE LOST DUE TO BACKLOGGING.


DEVICE    1, CLASS       1, WAS INVOLVED IN       1 TRANSMISSIONS,
     AVERAGING       8   MS.  UTILIZATION WAS  15   PERCENT.
DEVICE    2, CLASS       1, WAS INVOLVED IN       1 TRANSMISSIONS,
     AVERAGING       8   MS.  UTILIZATION WAS  15   PERCENT.
DEVICE    3, CLASS       1, WAS INVOLVED IN       1 TRANSMISSIONS,
     AVERAGING       8   MS.  UTILIZATION WAS  15   PERCENT.
DEVICE    9, CLASS       1, WAS INVOLVED IN      20 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   10, CLASS       1, WAS INVOLVED IN      20 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   11, CLASS       1, WAS INVOLVED IN      20 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   12, CLASS       1, WAS INVOLVED IN      10 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   13, CLASS       1, WAS INVOLVED IN      10 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   14, CLASS       1, WAS INVOLVED IN      10 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   15, CLASS       1, WAS INVOLVED IN       6 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   16, CLASS       1, WAS INVOLVED IN       6 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   17, CLASS       1, WAS INVOLVED IN       2 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   18, CLASS       1, WAS INVOLVED IN       2 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   27, CLASS       1, WAS INVOLVED IN       1 TRANSMISSIONS,
     AVERAGING       0   MS.  UTILIZATION WAS   0   PERCENT.
DEVICE   95, CLASS       1, WAS INVOLVED IN       4 TRANSMISSIONS,
     AVERAGING       3   MS.  UTILIZATION WAS  23   PERCENT.

MEMORY    1, SIZE     125 PAGES, HELD AN AVERAGE OF       3   PAGES,
     WITH A MAXIMUM OF       3 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1399   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      360
     CH/MS, AND THE AVERAGE RATE WAS        0.07CH/MS.
MEMORY    2, SIZE     125 PAGES, HELD AN AVERAGE OF       3   PAGES,
     WITH A MAXIMUM OF       3 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1399   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
     CH/MS, AND THE AVERAGE RATE WAS        0.01CH/MS.
```

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MEMORY    3, SIZE     125 PAGES, HELD AN AVERAGE OF       3   PAGES,
     WITH A MAXIMUM OF       3 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1399   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
     CH/MS, AND THE AVERAGE RATE WAS        0.01CH/MS.
MEMORY    4, SIZE     125 PAGES, HELD AN AVERAGE OF       3   PAGES,
     WITH A MAXIMUM OF       3 PAGES.  THE POTENTIAL TRANSMISSION RATE
     IS       1399   CH/MS.  THE MAXIMUM ACHIEVED RATE WAS      240
     CH/MS, AND THE AVERAGE RATE WAS        0.01CH/MS.

PROCESSOR   1, V.M.    1, WAS USED     22 TIMES FOR
     A TOTAL OF    49   MS.  UTILIZATION WAS  97 PERCENT.
PROCESSOR   2, V.M.    2, WAS USED     16 TIMES FOR
     A TOTAL OF    49   MS.  UTILIZATION WAS  97 PERCENT.
PROCESSOR   3, V.M.    3, WAS USED     16 TIMES FOR
     A TOTAL OF    49   MS.  UTILIZATION WAS  97 PERCENT.
PROCESSOR   4, V.M.    4, WAS USED     16 TIMES FOR
     A TOTAL OF    49   MS.  UTILIZATION WAS  97 PERCENT.

DATA LINK     1 WAS INVOLVED IN       2 TRANSMISSIONS, AVERAGING
          2   MS.  UTILIZATION WAS   7 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     2 WAS INVOLVED IN       2 TRANSMISSIONS, AVERAGING
          2   MS.  UTILIZATION WAS   7 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     3 WAS INVOLVED IN       2 TRANSMISSIONS, AVERAGING
          2   MS.  UTILIZATION WAS   7 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     4 WAS INVOLVED IN       2 TRANSMISSIONS, AVERAGING
          2   MS.  UTILIZATION WAS   7 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     6 WAS INVOLVED IN       1 TRANSMISSIONS, AVERAGING
          8   MS.  UTILIZATION WAS  15 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     7 WAS INVOLVED IN       1 TRANSMISSIONS, AVERAGING
          8   MS.  UTILIZATION WAS  15 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK     8 WAS INVOLVED IN       1 TRANSMISSIONS, AVERAGING
          8   MS.  UTILIZATION WAS  15 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    10 WAS INVOLVED IN      34 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    11 WAS INVOLVED IN      30 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    12 WAS INVOLVED IN      26 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    13 WAS INVOLVED IN      16 TRANSMISSIONS, AVERAGING
          0   MS.  UTILIZATION WAS   0 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.
DATA LINK    24 WAS INVOLVED IN       4 TRANSMISSIONS, AVERAGING
          3   MS.  UTILIZATION WAS  23 PERCENT.
     POTENTIAL TRANSMISSION RATE IS     120   CH/MS.

DATA SET   1, ON STORAGE UNIT     1, AVERAGED    10000   CH, AND REACHED
     A MAXIMUM OF   10000 CH.
DATA SET   2, ON STORAGE UNIT     1, AVERAGED    10240   CH, AND REACHED
     A MAXIMUM OF   10240 CH.
```

KEY BLOCKS -

	BACKLOG			AVERAGE DELAY (MS)		TIME
BLOCK	MAXIMUM	AVERAGE	CURRENT	ALL	DELAYED	72.05SEC.
1138	0	0	0	0	0	
1151	80	0	0	4	4	
1182	1	0	0	2	2	
1184	4	0	4	2.82	0	
1185	1	0	0	0	0	
1192	1	0	0	1.33	1.33	
1201	80	0.06	80	0	0	
1204	0	0	0	0	0	
1488	0	0	0	0	0	
1495	0	0	0	0	0	
1601	1	0	0	0	0	
1605	21	0	0	3.77	0	
1608	1	0	0	0	0	
1675	1	0	0	0	0	
1682	1	0	0	0	0	
1686	1	0	0	0	0	
1693	0	0	0	0	0	
1706	0	0	0	0	0	
1707	0	0	0	0	0	
1708	1	0	0	0	0	
1712	1	0	0	0	0	
1734	0	0	0	0	0	
1738	1	0	0	0	0	
1748	1	0	0	0	0	
1751	1	0	0	0	0	
1753	1	0	0	0	0	
1754	5	0	1	0.51	0	
1808	0	0	0	0	0	
1846	5	0	0	0.53	0	
1847	0	0	0	0	0	
1851	0	0	0	0	0	
1935	0	0	0	0	0	
1936	0	0	0	0	0	
3004	0	0	0	0	0	
3005	0	0	0	0	0	
3032	36	0.01	12	5.16	7.70	
3089	1	0	0	0	0	
6002	0	0	0	0	0	
8005	0	0	0	0	0	
9052	1	0	0	0	0	
11052	0	0	0	0	0	

(Page D-18 Blank)

SUMMARY FOR TIME 72050 , RELATIVE TIME 72050

STORAGE	CAPACITY	CONTENTS CURRENT	CONTENTS MAXIMUM	CONTENTS AVERAGE	NUMBER WITHDRAWN	AVERAGE PERIOD ALL UNITS
1	10000	10000	10000	10000.00	0	36025.00
2	10240	10240	10240	10240.00	0	36025.00
111	125	3	3	3.00	0	36024.50
112	125	3	3	3.00	0	36024.50
113	125	3	3	3.00	0	36024.50
114	125	3	3	3.00	0	36024.50
131	1399	1	360	0.07	14040	0.38
132	1399	0	240	0.01	480	2.00
133	1399	0	240	0.01	480	2.00
134	1399	0	240	0.01	480	2.00
151	17000000	20240	20240	20240.00	0	36025.00
152	17000000	0	0	0.00	0	0.00

FACILITY	PERCENTAGE UTILIZATION	NUMBER OF TIMES USED	AVERAGE PER. PER USE	CURRENT PRIORITY	CURRENT RECOURSE	NUMBER SHELVED
1I	0.07	22	2.23	23	2000	
2I	0.07	16	3.06	3	2000	
3I	0.07	16	3.06	23	2000	
4I	0.07	16	3.06	23	2000	
81U	0.01	2	4.00			
82U	0.01	2	4.00			
83U	0.01	2	4.00			
89U	0.00	40	0.00			
90U	0.00	40	0.00			
91U	0.00	40	0.00			
92U	0.00	20	0.00			
93U	0.00	20	0.00			
94U	0.00	20	0.00			
95U	0.00	12	0.00			
96U	0.00	12	0.00			
97U	0.00	4	0.00			
98U	0.00	4	0.00			
107U	0.00	1	0.00	52		
175U	0.02	8	1.50			
181U	0.01	2	2.00			
182U	0.01	2	2.00			
183U	0.01	2	2.00			
184U	0.01	2	2.00			
186U	0.01	1	8.00			
187U	0.01	1	8.00			
188U	0.01	1	8.00			
190U	0.00	34	0.00			
191U	0.00	30	0.00			
192U	0.00	26	0.00			
193U	0.00	16	0.00			
204U	0.02	4	3.00			

CURRENT TRANSACTION COUNT	509
MAXIMUM NUMBER OF TRANSACTIONS	768
NUMBER OF TRY OPERATIONS	69662
NUMBER OF TRANSACTION MOVES	231607
NUMBER OF VARIABLE EVALUATIONS	500040
MAXIMUM VARIABLE RECURSION	5
NUMBER OF ADMIT ATTEMPTS	654268
NUMBER OF FUNCTION POINTS	1152
MOST RECENT BLOCK ID	1754
NUMBER OF BLOCK SPACES USED	1918
NUMBER OF REPORT LINES	96
NUMBER OF VARIABLE ELEMENTS	1129
CURRENT UTILIZATION OF STACKS	2607

APPENDIX E
TERMS AND ABBRVIATIONS

A. A/D - Analog/Digital
ADI - Attitude Director Indicator
ADTA - Air Data Transducer Assembly
ALT - Approach and Landing Test
AMI - Alpha/Mach Indicator
Auto - Automatic
Avg - Average
AVVI - Altitude Vertical Velocity Indicator

B. BCE - Bus Control Element
BF - Brake Flap
bps - bits per second

C. CAS - Command Augmentation System
CH/MS - Characters per Millisecond (Appendix D)
CPDS - Computer Program Development Specification
CRT - Cathode Ray Tube

DD - Dedicated Display
DDPS - Digital Data Processing System
DDU - Digital Display Unit
DEU - Display Electronic Unit
DFN - Discrete Function
DMA - Direct Memory Access
DU - Display Unit

F. FAOI - Flight Aft Operational Instrumentation
FCOS - Flight Computer Operating System
FCS/DD - Flight Control System/Digital Data
FDI - Fault Detection and Identification
FDIR - Fault Detection Identification and Recovery
FFOI - Flight Forward Operational Instrumentation
FSW - Flight Software
FSSR - Functional Subsystem Software Requirements

G. GPC- General-Purpose Computer

I. ICC - Inter-Computer Communication
IMSIM - Information Management System Interpretive Model
IMU - Inertial Measurement Unit
IOP - Input - Output Processor
I/O - Input/Output

K. KB - Keyboard
KBPS - Kilobits per second
KBU - Keyboard Unit

L. LDB - Launch Data Bus

M. MCDS - Multifunction CRT Display System
MDM - Multiplexer/Demultiplexer
M/D - Manual/Direct
M E - Message Ends (Appendix C)
MM - Mass Memory
MODLIT - SDC Discrete System Simulator
ms - millisecond
MS - Message Start (Appendix C)
MSC - Master Sequence Controller
MSC - Moding, Sequencing and Control
msg - message
MSBLS - Microwave Scan Beam Landing System

N. NASA - National Aeronautics and Space Administration

O. OMS - Orbiter Maneuvering Subsystem
OPS - Operations or Operational Sequence
OT - Operational Instrumentation

P. PCMMU - Pulse Code Modulator Master Unit
PL - Payload

R. RM-Nav - Redundancy Management - Navigation
RM-Cont - Redundancy Management - Control

S. S.D. - Std. Deviation
SDC - System Development Corporation
S.M. - System Management
S.O.W. - Statement of Work
Spec - Specialist

T. TACAN - Tactical Air Navigation
TAEM - Terminal Area Energy Management
T E - Task Ends (Appendix C)
TI - Task Interrupt (Appendix C)
TOT - Total
TS - Task Start (Appendix C
TUS - Time Units (Appendix C)
TVC - Thrust Vector Control
T W - Task in Wait State (Appendix C)
T X - Task in Execution (Appendix C)

U. UI - User Interface

V. V - Variable
VIRT MACH - Virtual Machine (Appendix D)
VM - Virtual Machine

W. WONG - Weight on Nose Gear

X. X - Savex Cell

APPENDIX F

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